# THE IRON TRADE REVIEW

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## THE IRON TRADE REVIEW.

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CLEVELAND, O., FEBRUARY 19, 1891.


## THE WEEK IN IRON CIRCLES.

General Features.

A significant event of the week in iron circles has been the sale, in the Pittsburgh district, of a lot of No. 2 Southern foundry iron at $16.15, all-rail delivery, cash on cars at Pittsburgh. This, it need hardly be said, is unusual, as very little iron has gone there from the South save by river. The transaction was of Lady Easley iron, which is recognized as being equal to Pittsburgh's native irons, and the purchasers are said to be willing to pay on a basis equivalent to their all-ore brands. There is a general disposition on the part of consumers to take advantage of the present low prices; and this is stimulated from the fact that Eastern buyers in the vicinity of Pittsburgh are causing activity among Southern irons, as above indicated. The week at Cincinnati closed with more signs of strength than have been exhibited in the market for several months. The buying movement has been heavier than has been witnessed for a long time. Stocks of Southern coke irons have been slowly diminished, and with an active demand and curtailed production, the turning point has finally been reached. There are buyers to-day of round blocks at 50 cents per ton higher than iron was offered for January 1st. The Connellsville coke strike has something to do with the activity of demand and the strength of prices. Stocks also are being steadily reduced and production in the country at large is at the lowest rate records since September, 1889. It is believed that there is a foundation for a good heavy market from this time on. There are those, however, who maintain that between slack railroad demand, short crops, heavy production and large stocks on hand, there is little room for any substantial advance. Charcoal irons continue to drag and prices are at perhaps the lowest range ever recorded. Only a moderate amount of activity, on the other hand, has characterized the Chicago market during the week. The transactions which have taken place have been almost exclusively in the way of coke irons, there being at present no demand of any size for charcoal brands. On coke irons, particularly those made in the Alabama district, sellers are presenting a firmer front as to prices, there being less in the way of special cuts, than for some time past. While indications point to no material advance in prices in this line, it is apparent that nearly all the special cheap lots of iron which have been pressing the market, have now been picked up. Our advices from Detroit are to the effect that the coke strike now being on, and there being little doubt but that it may continue for some weeks, added to the fact of the idle furnaces in the Mahoning and Shenango Valleys, and still further to the unsettled condition of labor in the South, has finally caused a break in Southern iron prices in the right direction. There were several transactions of considerable magnitude in the Detroit market for Southern iron, chiefly for low grades, during the past week. The last iron purchase went at from 50 cents to $1 per ton higher than purchases first made in the early part of the week, and buyers seem to be alive to the fact that there may be, notwithstanding the recent addition to the surplus of unsold iron, a short iron supply if the present hinderances we have noted, continue, and while this cannot be said to be a brighter outlook, it certainly is a relief to find prices on the rising plane. There were also closed some lots of Lake Superior, for car wheel and malleable purposes, and there still remains some good-sized inquiries unsatisfied. The price of Lake Superior, however, has not varied at the present writing from recent quotations. At Louisville there was free buying during the week, some of the purchases being for large amounts. One transaction for 10,000 tons was on basis of $10 for grey forge at furnace for delivery during six months. Of the irons offered, silvery was especially scarce, but one of the largest companies South quoted 1,000 tons, on basis of $11, furnace, for flaky or open. There were also some sales in quantities of 500 to 1,000 tons for delivery during six months. On a lot of 1,000 tons of No. 1 foundry, the price was shaded to $12, on cars at Birmingham, and a sale was made, though the usual basis has been $12.25. Inquiries were made freely at St. Louis during the week for small lots of Southern and Ohio irons. Buyers, however, hesitate making large purchases, but we find in most cases it is not the condition of the market that prevents them, but a lack of work. Should trade present a brighter future, consumers would find some difficulty in placing their orders at the current market figures. The miners' strike in the Connellsville district will prove a serious disturbance to the foundry trade generally, and will probably be a long-fought contest. The pig iron market at Buffalo continues to slowly improve in tone under stationary prices. There is decidedly more activity and life to the market and greater confidence in the minds of consumers regarding the covering of future requirements.

The Local Situation.

The inactivity of the market continues, and little, if anything, is being done in the way of a betterment until the factors in the iron trade shall have agreed upon some basis of settlement. It is far too early to speculate even upon the outcome of the disturbances which have combined to unsettle all activity in the iron line, and there is little hope that any clearer view will obtain thirty days hence. The continued stoppage on the part of the furnaces in this district, coupled with the fact that the mills are in full blast, has the natural effect of reducing the present stocks of iron, so that some little inquiry for raw material has been manifested during the week. Nevertheless, there has been no gain in prices, and consumers insist on buying as they go, taking only small quantities, and for immediate use. The coke situation remains practically unchanged, both miners and operators insisting on their several points. In order to sell coke at $1.50, and it is conceded on all hands that the furnaces cannot start up with coke at a higher rate than that figure—the operators insist that the wages of their employes must be cut ten per cent., and the men are equally firm in asking an advance of 12½ per cent. Whichever way the dispute is to be settled, it may be set down that in the event of a resumption of work, there must be a reduction in the price of furnace labor, and the men perfectly understand and are willing to take into account the necessities of the case. The end of the month is looked forward to with considerable curiosity, in order to learn the amount of pig stock now held, and to compare it with the returns for January. Some fears are expressed that if the consumption of stocks should go on too rapidly, the advance that must eventually come may occasion a disturbance of the agreement under which the Valley furnaces banked their fires, and in this way defeat the object of the very organization that was to reorganize the business of making pig iron on a healthier, if lower basis, with a consequent narrowing of the profit margin. The transfer of the Schlesinger properties to the Vanderbilt interests, mentioned last week, seems to have been held in abeyance for a few days, and the chances are that the deal will be perfected this week. In that event Mr. Schlesinger will still control important mining interests, viz., the Florence, Iron River, Dunn, Armania, Youngstown and Claire mines, on the Menominee range, and the Sunday Lake, on the Gogebic range. Late reports from the Valley mention the sale of a round lot of Bessemer pig at $16, at the furnace, but nothing could be learned as to the time of delivery.

## SOUTHERN SAUNTERINGS.

Edward Atkinson, in his admirable brochure on "The Future Situs of the Iron Production of the World," ventures this prediction:

**If one should stand upon the top of the highest peak among the Great Smoky mountains, in the heart of the Southern Appalachian chain, and could bring within his vision all that would come within a radius of seventy-five to a hundred miles, he might be able to establish the center of iron and steel production, which could not be far away from what has been called the "center of gravity" of the population of this country. If he could then bring within his vision the whole configuration of the area enclosed within a circle of about one hundred and fifty miles in diameter, centering on the Great Smoky mountains, he might trace the lines made by the erosion of the rivers and the gaps in the ranges on which the rails may be laid to the Northwest at the southern border of Ohio, and to the Southeast on the way to the Atlantic ports of South Carolina, over which the metal produced at the possible future center of the iron production of this country may be distributed on the easiest grades, either for domestic consumption or for the supply of foreign markets.**

Whatever be said of the soundness of this prophecy, a hasty run within the "charmed circle" does not fail to discover many evidences of a coming supremacy in the production of iron. Whether the point of view be the summit of the Great Smoky mountains, or the crest of Mission Ridge, or the uplands bordering the Tennessee River, the boundless resources of the New South are made clearly manifest. Within the radius indicated are some of the finest blast furnaces in the world, not to speak of the manifold industries which are day by day becoming more and more diversified. New railroads are rapidly penetrating to the coal and iron fields, and the whole South is feeling the pulsations of a new life.

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Nevertheless, these are trying days for some of the "boom" towns. The financial stringency caught some of them unawares; the shut-down of a great majority of Alabama furnaces has furnished added material for the pessimistic prophets, and the arrested flow of Northern and foreign money into investment channels has combined to try the souls of the zealous advocates of Southern development. It is quite evident, also, that many of the new industries, whose establishment was so loudly heralded by the Southern "boom" papers, have either never started, or they have "run well" for a little time and then stopped—fit emblems of the ephemeral character of enterprises inaugurated under contract by the average promoters. A census of abandoned or suspended enterprises might not be so inspiriting, but it would, in newspaper parlance, be "mighty interesting reading." There is, however, no perceptible diminution of the hopeful spirit of the New South. Checked the industrial movement may be; but it is bound to move irresistibly forward.

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It is a pleasure to note that by no means all the new towns and revivified old ones have been caught by the money squeeze. Chattanooga, of course, has conquered a place which she holds as securely as if entrenched behind her over-shadowing, rock-ribbed ramparts. Birmingham and other leading centers are, of course, beyond the influence of temporary checks, while the whole brood of lively, struggling "future greats" bring up the rear. Some of these appear to the casual passer-by as made up principally of long "streets" outlined at night by the glare of arc lights, which give the appearance, at least, of a vista of imposing buildings; but the majority of them are, to use a localism, "in the swim" of prosperity, and will be heard from hereafter.

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Among the old-new towns may be mentioned Florence, which, starting with the nucleus afforded by a staid old Southern county seat, has begun a series of permanent improvements that speak well for the liberality and far-seeing wisdom of the citizens. Laid out in 1819 by General Andrew Jackson and a coterie of distinguished statesmen of the day, it found its *raison d'etre* in the fact that it was at the head of navigation on the Tennessee River, the famous Muscle shoals cutting off further progress by steamers northward. For a time it enjoyed a large wholesale trade, being a distributing point for Northern Alabama and Eastern Tennessee; but, like most river towns, it lost its prestige in this respect when the railroads came into vogue. The recent opening of the great Muscle shoals canal, just above the city, is expected to largely increase the river traffic, and the opening up of new railroads is no longer considered a standing menace to the town's prosperity. It is a typical Southern town of the present day, with just enough of the old-time aristocratic sleepiness to bring out in marked contrast the pushing proclivities of the younger generation. And certainly no more wide awake and hospitable a community is to be found south of the Ohio River.

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Twenty-three miles north of Florence, just across the Tennessee line, can be seen the cheapest iron mining in the world. Miners of the hard ores of the Michigan Peninsula, and even of the softer ores of the Gogebic Range, will hardly be prepared to see the ore taken out from the face of a 75-foot vein, like gravel from a gravel-bank, by steam shovels; yet that is the only kind of mining known in the region mentioned. From the shovel the ore is dumped into tram-cars, which are run by gravity to the washing apparatus, where, after cleansing, sorting and picking, it is dropped into the gondola cars that are run directly beneath the chutes. Two tram-car-loads produce a ton of ore, while the washings are spread over the adjacent valley in prodigal profusion. It is a brown hematite and averages, perhaps, something under 48 per cent. metallic iron. What is the cost of the ore? Well, it may be less than a dollar on board the cars, royalty included. At any rate, the Tennessee River furnaces get it at their yards for about one half the price paid for similar grades of Lake Superior ore. They are not yet so well situated as to fuel, however. Two dollars and ten cents is the quoted price at Florence, but $1.70 is said to be a figure more recently obtained. At the splendid new furnace at Florence, just being completed by Philadelphia capitalists, ore and coal are being piled up at very favorable prices, in readiness for blowing in, whenever the market shall justify the same.

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Sheffield, Florence and other river towns, it seems to us, possess especial advantages for the future by reason of the check on freight rates, which the Tennessee affords. It is said (how truly we do not know) that, during the Spring of 1890, the furnaces at Sheffield (directly across the river from Florence) saved about $12,000 in freight on a single shipment by river, to Pittsburgh, of 5,000 tons of pig iron. Certain it is that better comparative rates can be had at the river towns than at the interior towns like Birmingham, however advantageous may their location with reference to the coal and ore beds. And, after all, is not the race to the producer who can the most cheaply send his goods to market and who, by the very nature of his situation, has a perpetual check upon excessive railroad changes? Such, at least, is the experience of our lake cities, and the river towns seem likely to profit in the same direction.

W. M. D.

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## THE PROFITS OF PITTSBURGH IRON AND STEEL WORKS.

We have received the following communication from the correspondent whose figures concerning the alleged profits of Pittsburgh iron and steel works, we took occasion to call in question in a recent issue:

**In your issue of the 29th ult., in an article using my name, no one hit the truth better than you, when you remark of the Pittsburgh newspaper jayhawks, giving hardly one-tenth of the true facts of labor news, and so far as my statement is concerned, you seem to be wonderfully surprised. What surprises you? Is it because I have underestimated the manufacturers? That is what some say, and none have as yet ventured to deny anything I say about them. I put the Penn Forge at 8,000 tons and $24,000. One of the firm told me the output was 8,600 tons. The daily profit of the Carnegie's firm is over $20,000, and not a roller is or will be made in one of their plants in the next two years, and the daily expense to run it is $8,000. For a week, day and night, it takes more money to run the Alleghany county works of this firm, than what it costs to pay the salary of the President of the United States for nine years. The profit made by all the Pittsburgh manufacturers, excepting a few last year, I consider as not being very much. The average public do not consider the expense to run a mill. The Vesuvius here, is one of the smallest iron mills in the district. The finishing capacity is greater than the real output. I placed the firm at 27,000 gross tons, and $100,000 profit, but the actual output was 35 000 net tons finished. And here is the cost to run the mill, a double turn or 24 hours; 80 tons of metal at $15 a ton, would be $1,200; then $16 to make it into a finished product, $1,280. The firm buys on an average of 80 tons of muck bar at $27 a ton, $2,160; and $7 a ton to finish it, $560, or $2,720, would be a total of $5,200. That includes everything from the first to the last stage, and also taxes, clerks, managers and insurance. There is a gain and a loss that I cannot explain. The amount finished daily is 150 net tons, and the average profit is $5 a ton. The wages remain intact for one year, but suppose there is a loss of 10 cents a pound, it will as you can see be $300. In the way that you have used my name please accept my sincere thanks. You will find a weekly review of the industrial situation from this district in the *Labor Tribune*. If any of the *Review* people come around this place I will welcome them at any time. Very respectfully yours,** NICK DALE

SHARPSBURG, PA., Feb. 10, 1891.

We have no desire to enter into any controversy with Mr. Dale, and only publish his letter as a matter of justice and fair play; but we may still be permitted to entertain very serious doubts, amounting to almost absolute discredit, as to the reliability of his data, as published.

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## THE GREAT COKE STRIKE.

The strike of cokers in the Connellsville region, which began last week, is peculiar in this: it is at once a strike and a lock-out. The miners demanded an average increase of 12½ per cent. in wages, and

the operators insisted upon a reduction of 10 per cent., hence the determination on both sides to cease operations. A comparison of the wages paid in the Connellsville region with those paid in other sections of Pennsylvania, as well as in West Virginia and Alabama, shows that all classes of labor in the Connellsville district receive higher rates than those elsewhere.

There is very little prospect of the coke famine, however. Upon this point the Connellsville *Courier* says:

**The chief customers of the large operators are abundantly supplied with coke. They have, in fact, for months past been fortifying against such a contingency. They are, consequently, undisturbed by the strike, and the operators supplying them are correspondingly firm in their demand for a reduction.**

The present situation is a wind-fall for the Virginia coke regions, the attention of Eastern consumers being naturally turned in that direction.

Of the 16,119 ovens in the Connellsville district, all but 833 have closed down. The active ovens are owned by Mr. W. J. Rainey, of Cleveland, and are run under the protection of Pinkerton detectives.

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ON page 16, we have opened up a new departure to which we call the attention of our advertisers and subscribers. We shall be glad to have them make use of this department and hope it will result in good returns to both them and the paper. We will forward all letters to the respective advertisers.

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### A New Process for the Manufacture of Aluminum Iron.

**The Stefanite aluminum process aims at introducing aluminum into iron, either in the blast-furnace, the cupola, or the puddling furnace. During the process of manufacture the liberation of the aluminum from its ores going on concurrently with the iron-smelting, the newly-formed metal being instantly alloyed with the iron. It is well known that a minute percentage of aluminum has the effect of lowering the melting point of iron and steel, rendering its adoption very slow, in spite of the great economies which have been effected by the various electric and electrolytic processes for the production of aluminum. It is with the intention of reducing this cost that the Stefanite process is being introduced. This method of operation consists in the addition to the iron ore in the blast-furnaces, or to pig in the cupola, of emery and alum, either in powder or made up into briquettes. It is stated that the reaction of the alum on the emery gives rise to vapors of metallic aluminum, which instantly alloy themselves with the iron, imparting to it the improved qualities which have hitherto been gained by the addition of aluminum or ferro-aluminum in the ladle or the crucible. The subsequent blowing does not volatilize the aluminum which descends with the iron. When the materials are added in the puddling furnace the bars, it is stated, can be hardened and tempered like steel, while their tensile strength is increased. The invention is in the hands of Mr. Thompson Freeman, of No. 2, Victoria mansions, Westminster.**

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### Some Southern Statistics.

**Since the Census of 1880 the increase in population in the South has been 19 9 per cent, the total now being 17 550 920, divided as follows: Whites, 11,361 996; colored, 6 194,924 The increase in the white population has been 26.2 per cent, in colored only 10 per cent. There are 475 930 persons of Northern birth in the South against 240 385 ten years ago. The assessed wealth is $3,884,057,164, and the actual wealth is estimated at $9 751 815 635. The State debts aggregate $96,460 126 county debts $20,511 479, municipal debts $66 800,748; total public indebtedness $183 772,053. The capital invested in the South during the decade reaches $2,339 17 ,000 The mileage of the railroads is 41,116, and the men employed number 188 731. The number of manufacturing establishments is 56 714, with a capital of $551,483 800; hands employed 537,086; value of product $742,865,200. Of cotton mills there are 334. The value of cotton produced during the decade is $8,091,936 833; tobacco, $31,278,523; total value of all farm products, $984,707,000. Amount given to negro education since the war, $56,181,370. Negroes at school, 1,012,029.**

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### Deepest Bore-Hole in the World.

**According to a lecture delivered by Mr. Mohs in the Society of German Engineers, the deepest bore-hole of the earth is found in the province of Saxony. It has been made by the Prussian administration of mines, in the general interest of the country, for the eventual opening of coals near the village of Schladebach, near the stopping place Kotschau on the railway line Corbetha Leipsig. The total depth of this bore-hole, which has been made with a hollow diamond rock-drill and water-flushing during three and a-half years, is 1 390 meters, its lower width 48 millimeters and at the top 280 millimeters. The expense amounted to more than 100,000 marks.**

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### Strength of Steel Wire Rope.

**The railway line up to the Superga at Turin, is worked by a rope consisting of six plies of 8 wires each, or 48 wires in all. The diameter of each wire is 0.078 inch, of each ply 0 315 inch, and of the whole rope 0.985 inch, the weight being one pound per lineal foot. Tests from eight single wires from one ply gave a breaking load of from 908 to 1,060 pounds, equivalent to from 83 5 to 97 4 tons per square inch. The breaking load of the remaining five plies was 91 1 to 101 1 tons per square inch. Taking the net sectional area of the rope at 0 225 inch, and the lowest result above given as the average, the total breaking weight of the rope would be 19.3 tons per square inch.**

## CONDITION OF THE BLAST FURNACES OF THE UNITED STATES.

### February 1, 1891.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

| LOCATION OF FURNACES. | CHARCOAL. Total No. of Stacks. | CHARCOAL. In Blast. No. | CHARCOAL. In Blast. Week'y capacity. | CHARCOAL. Out of Bl'st. No. | CHARCOAL. Out of Bl'st. Week'y capacity. | BITUMINOUS OR COKE. Total No. of Stacks. | BITUMINOUS OR COKE. In Blast. No. | BITUMINOUS OR COKE. In Blast. Week'y capacity. | BITUMINOUS OR COKE. Out of Bl'st. No. | BITUMINOUS OR COKE. Out of Bl'st. Week'y capacity. |
|---|---|---|---|---|---|---|---|---|---|---|
| New England | 14 | 9 | 808 | 5 | 398 | | | | | |
| New York | 9 | 2 | 275 | 7 | 847 | 6 | 3 | 1,992 | 3 | 2,204 |
| Pennsylvania | 14 | 3 | 202 | 1 | 793 | 1 | 0 | 0 | 1 | 600 |
| Upper Susquehanna Valley | | | | | | | | | | |
| Pittsburgh | | | | | | 24 | 20 | 24,443 | 4 | 4,968 |
| Spiegel | | | | | | 1 | 0 | 0 | 1 | 560 |
| Allegheny Valley | | | | | | 1 | 0 | 0 | 1 | 930 |
| Shenango Valley | | | | | | 17 | 6 | 4,703 | 11 | 8,712 |
| Youghiogheny Valley | | | | | | 4 | 1 | 1,097 | 3 | 1 815 |
| Juniata and Conemaugh Valleys | | | | | | 19 | 9 | 4,018 | 10 | 4,960 |
| Spiegel | | | | | | | | | | |
| Maryland | 7 | 4 | 374 | 3 | 370 | 3 | 1 | 1,387 | 2 | 1,487 |
| Virginia | 11 | 2 | 96 | 9 | 578 | 13 | 6 | 3,220 | 7 | 3,246 |
| North Carolina | | | | | | 1 | 1 | 100 | 0 | 0 |
| West Virginia | 2 | 0 | 0 | 2 | 130 | 6 | 1 | 1,080 | 5 | 2,526 |
| Ohio—Mahoning Valley | | | | | | 15 | 3 | 2,214 | 12 | 10,616 |
| Eastern, Central and Northern | | | | | | 17 | 14 | 11,682 | 3 | 1,960 |
| Hocking Valley | | | | | | 14 | 3 | 782 | 11 | 2,320 |
| Hanging Rock | 12 | 5 | 394 | 7 | 740 | 14 | 9 | 2,097 | 5 | 940 |
| Miscellaneous | | | | | | | | | | |
| Kentucky | 1 | 0 | 0 | 1 | 90 | 5 | 3 | 893 | 2 | 720 |
| Hanging Rock | | | | | | | | | | |
| Western Region and Miscellan'ous | | | | | | | | | | |
| Tennessee | 8 | 5 | 1,255 | 3 | 325 | 12 | 9 | 4, 52 | 3 | 1,276 |
| Georgia | 3 | 1 | 133 | 2 | 246 | 2 | 1 | 586 | 1 | 675 |
| Alabama | 14 | 6 | 1,493 | 8 | 1,627 | 38 | 15 | 10,070 | 23 | 14,673 |
| Indiana | | | | | | 2 | 2 | 365 | 0 | 0 |
| Illinois | | | | | | 14 | 8 | 9,849 | 6 | 4,496 |
| Michigan | 22 | 13 | 4 156 | 9 | 2,532 | | | | | |
| Wisconsin | 5 | 4 | 2,0 4 | 1 | 120 | 4 | 3 | 2,38 | 1 | 422 |
| Minnesota | | | | | | 1 | 0 | 0 | 1 | 140 |
| Missouri | 2 | 2 | 611 | 0 | 0 | 5 | 0 | 0 | 5 | 3,764 |
| Texas | 3 | 1 | 205 | 2 | 506 | | | | | |
| Oregon | 1 | 1 | 125 | 0 | 0 | | | | | |
| Colorado | | | | | | 2 | 1 | 319 | 1 | 350 |
| Utah | | | | | | | | | | |
| Washington | 1 | 0 | 0 | 1 | 205 | | | | | |
| Total charcoal and coke | 129 | 58 | 12,141 | 71 | 9,515 | 241 | 119 | 87,439 | 122 | 74,360 |
| Total anthracite | 162 | 97 | 39 759 | 65 | 20,740 | | | | | |

#### SUMMARY.

| FUEL. | In Blast. Number. | Month Previous. | Year Previous. | In Blast. Weekly Capacity. | Month Previous. | Year Previous. | Out of Blast. Number. | Month Previous. | Out of Blast. Weekly Capacity. | Month Previous. |
|---|---|---|---|---|---|---|---|---|---|---|
| Charcoal | 58 | 61 | 61 | 12,141 | 12,459 | 12 653 | 71 | 67 | 9.515 | 9,262 |
| Anthracite | 97 | 102 | 112 | 39.759 | 41,952 | 45 681 | 65 | 60 | 20.7 0 | 19.316 |
| Bituminous | 119 | 143 | 167 | 87,439 | 109,870 | 116,798 | 122 | 99 | 74,360 | 57,484 |
| Total | 274 | 306 | 339 | 139 339 | 164,281 | 175 132 | 258 | 226 | 104,'15 | 86 062 |

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### THE CIVILIZING METAL.

**An International Iron Congress recently met in New York. Among its members were not only skilled manufacturers, but men of high attainments in science. They come from almost every civilized country in the world. It is presumed that each brings with him some knowledge that is unknown to the others Iron has been wrought since the days of Tubal Cain, but there are still many things to be found out about it. Indeed, there are good reasons for believing that many processes employed by the Saracens and others are now numbered among the "lost arts." No one can now produce steel equal to that in the Damascus sword blade. But the present age has witnessed wonderful changes in the manufacture of iron and steel. The hot-blast reducing furnace and the Bessemer converter are among the greatest inventions of all times and countries. They have rendered the production of iron and steel speedy and cheap. Other discoveries and inventions are needed to render these substances still more useful to the world. Iron is fast superseding wood in the construction of vessels and bridges. Wire has taken the place of boards and nails in the building of farm fences. Iron posts are fast coming into general use. More buildings chiefly composed of iron, are being erected every year. The cheaper iron and steel become the greater the number of purposes to which they will be put. The civilization of a country can be accurately estimated by the amount of iron it uses. Barbaric people often use much silver and gold, but they make little or no use of iron. What are known as the precious metals are employed in the fine arts, but iron is the metal wanted in heavy arts. It is capable of many properties, some of which fit it to almost any use. No country has as much iron ore, coal, and wood for producing charcoal, as the United States, and it seems somewhat strange that, in face of the facts, the pretense can be maintained that we can not produce iron and steel as cheap here as they are produced elsewhere. It is certain that we can, though interested manufacturers are constantly trying to convince legislators that we can not.—[Southern Progress, Louisville.**

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### The Engineer and His Workmen.

**A paper on the above subject was read before the members of the Civil and Mechanical Engineers' Society at the Westminster Palace Hotel one night recently, by Mr. R. Capper. After setting forth at length his objections to the system of trades unionism at present in vogue, the lecturer detailed what he considered to be the true remedies for dissatisfaction on the part of employers or employed. Conciliation Boards, he said, though excellent institutions in their way, were hardly satisfactory, inasmuch as the majority of the settlements claimed to be adjusted by such boards were only "patched up." Profit-sharing schemes had also much to be said in their favor; but it**

was to the proposed labor union of employers and workmen, suggested by Sir W. T. Lewis, that he looked for the best results. By the aid of such an institution—to the funds of which both parties contribute, and in the conduct of which each party would have equal voice—disputes might be satisfactorily arranged without recourse to strikes or lockouts. Employers who paid the wages would retain the right to choose their own workmen; and workmen, when chosen, would obey orders. In addition to its many other advantages, the scheme would help workmen over the initial difficulty of beginning to put by a little money, and it contained the embodiment of the principle on which have been founded the numerous successfully worked miners' permanent relief funds. A discussion ensued, and the meeting terminated with the usual votes of thanks to the lecturer and the chairman.—[Iron and Coal Trades Review.

## SILICON IN RAIL STEEL.

Abroad no single engineer has given to the question affecting the wearing qualities of rail steel such thoughtful consideration as has Christer P. Sandberg, of London. In a paper read before the Institution of Mechanical Engineers, he has embodied the results of his latest investigations. Particular interest attaches to conclusions bearing on the influence of silicon, which we give below:

1. By silicon up to 0.30 per cent., with carbon up to 0.30 or 0.40 per cent., the steel is neither hardened nor made brittle, and its strength is diminished in only such a small degree as not to imperil the safety of the rail, judging, at least, from a severe transverse impact test under a falling weight.

2. Silicon up to 0.20 or 0 30 per cent. certainly makes the steel quiet in casting, and free from small honeycombs or blisters; but in cooling from a fluid to a solid state it draws or shrinks much more than rail steel containing only 0.10 per cent. of silicon, or less. The ingots, particularly large ones weighing a ton or more, are very liable, in cooling, to form a hole in the centre, which, when the ingot is rolled into rails, produces in the web or neck of the rail a seam not welded. From this fault a fracture of the rail may occur, and it may be more disastrous than the peeling off in thin scales that arises from small blisters round the exterior surface of the ingot, which are formed when silicon is low. Thus, high silicon steel can be used with safety in small ingots only—say, of not more than half a ton. This explains the favorable results obtained with such steel in Russia, where probably small ingots are made for single rails only. In the large ingots of, say, one ton and upward, for three or four rails, as now rolled in England, more than 0.10 to 0.15 per cent. of silicon should not be aimed at, on account of the greater shrinkage produced thereby. The danger is, therefore, seen of fixing upon one composition as applicable to all makes of steel, and it is clear that care should be taken in considering all the reasons before changing the practice. For instance, what will do for working small ingots in Russia, and elsewhere, will not answer for large ingots as worked in England, and engineers would do well to leave the silicon question to the rail maker, who, in every case, has the best experience of what suits his own requirements. and those of the users generally. These results respecting shrinkage arising from silicon in stele agree with those given by Mr. Hadfield, in his recent paper on alloys of iron and silicon (Iron and Steel Institute Journal, 1889, II., page 222); but as he experimented with ten times as large a percentage of silicon as in the case now under consideration, and not directly upon rails, the present experiments may be a better guide to the solution of the question of silicon in rail steel.

3. As for a high percentage of silicon in basic steel, it has the same effect on shrinkage as in the Bessemer steel. But it should be remembered that silicon, added in the form of hematite pig iron before the manganese is put in the ladle, is what prevents the rephosphorization of the basic steel; and that without this valuable discovery, made by E. Windsor Richards, when manager of Bolckow & Vaughan's steel works, at Middlesborough, the basic steel rail would have died a natural death. However, there is only just enough silicon added to take up the oxide of iron, and protect the steel from rephosphorization, and none, or very little is left in the steel, say, from a mere trace up to only 0.06 per cent.; and as there would be the same shrinkage in large ingots as with high silicon Bessemer steel, no experiments with basic steel have been found necessary.

Thus both for Bessemer and for basic steel, the presence of such a high percentage of silicon as is used in Russia, say, 0.25 per cent., seems not applicable in England, unless small ingots were reverted to, which again would be a disadvantage, because the larger ingots mean more work put upon the steel, and therefore better are the rails. The ingots experimented with weighed 28 to 30 cwts. each, enough for four rails of 80 lbs. per yard, and 30 feet long. In Bessemer steel rails, therefore, the author sees no reason to interfere with the silicon, and he recommends leaving it altogether to the option of the maker. For tires and axles, which are made from smaller ingots than rails, it might be a decided advantage to use up to 0.20 per cent. of silicon, in order to get them solid; and he believes this is done by the makers when they have no chemical composition stipulated.

There seems to be no difficulty in obtaining a high percentage of carbon —0.40 to 0 45 per cent.—by the basic process as well, and to the same extent, as by the Bessemer, though with somewhat less silicon in the basic steel; and this should annul the general condemnation of the basic rails that was pronounced at the congress, simply because they were made by the basic process.

## How Can Iron Pulleys be Papered?

First cleanse the pulley from grease with sal soda (washing soda). Then scratch the whole surface with a file. Wet with dilute nitric acid for a few minutes to deaden the scratches, clean with water, and dry. Apply the paper by winding, using the strongest glue, or the paper may be wetted with tannic acid and then applied as above. Some prefer to add a tablespoonful of glycerine to a quart of glue and then apply hot. Turn off the edges and apply a coating of common shellac.

## LAKE SUPERIOR MINING NOTES.

VERMILION AND MESABA RANGES.

The Myrna Iron Mining Co. was incorporated at Duluth, Feb. 9, with T. H. Presnell, Frank Hoibbing, Richmond D. Mallett, Alexander J. Trimble and Frank I. Tedford as incorporators. The capital stock is $200,000 divided into 100,000 shares of $2 each. Capt. Frank Hibbing informs us that they are working on the n½ of ne¼ of section 11, and the s½ of the se¼ of section 2, all in 59-14, just north of and adjoining the Mallman. They are four feet in ore, very much like the Mallman. The land is that formerly operated by the Eureka Mining Co.—[Vermilion Iron Journal, Tower.

GOGEBIC RANGE.

In spite of the rather discouraging condition of the iron ore market, the interest in new developments do not seem to lag much on any part of the Gogebic range, but operators are pushing along with about as much vigor as ever, though in some cases, perhaps, the outlook has deterred men from opening up new options, and in one or two cases, holders have secured an extension and taken a lay-off until Spring. The operations in the Upson district have not been decreased to any great extent, but most of the options are being explored. The mining men are confident that with the opening of Spring, the market for Gogebic ores will open all right, and that 1891 will have a prosperous season for our mining industries. They remember the situation two years ago, when no selling contracts were made until late in the Spring, but the season turned out to be the best in the history of the range, in some respects, though prices ruled lower than in 1890.—[Florence Mining News.

The shaft at the Ryan mine (Old Trimble) is still in ore, and has now gone down some 25 feet in the same material. The ore runs 60 per cent. iron and is low in phosphorus. It is evident that this lens is not the same as the one worked during the past two years at Section 53, just to the east, but overlaps that one.—[Florence Mining News.

MARQUETTE RANGE.

The new shaft of the Lake Superior Iron Co. has reached a depth of 350 feet, says the Ishpeming *Iron Ore*. Ore has been encountered in the shaft, this giving something of a surprise, as it was thought that the shaft would go down in the foot, avoiding the ore. To further prove the extent of the deposit a diamond drill has been employed for the past few weeks and the result indicates that a deposit of great value has been here met with. The lens the drill has been cutting dips to the north, pitches to the west, and has a northwest by southeast trend, and gives promise of being of large dimensions. The ore is of Bessemer grade, giving about 65 per cent. in metallic iron and from .025 to .032 in phosphorus.

During the past year the existence of two distinct veins of ore running east and west and separated by about 100 feet of diorite has been fully established at the Wheat mine. Each is from 25 to 30 feet in width, well defined, and has been opened in length about 200 feet, with both ends of the opening still in ore. An analysis of samples taken from the south vein showed it to be .031 in phosphorus, while the ore of the north vein is somewhat higher, though within the Bessemer limit.—[Florence Mining News.

The Gertrude mine is working in good shape. They are putting down a perpendicular shaft, 12x8, and calculate to strike the foot-wall in about 500 feet. The vein is running about 80 degrees southwest, and it is calculated to be a large body of ore.—[Florence Mining News.

MENOMINEE RANGE.

The Mansfield has contracted to deliver 10,000 tons of its most excellent product to the Illinois Steel Works, at Chicago, by the opening of navigation. The 10,000 tons of Mansfield ore will be converted into steel rails for which it is expressly adapted. The ore is an extremely high grade Bessemer, and is in great demand by the steel men of the country.—[Florence Mining News.

The Hemlock mine is now shipping a large quantity of its most excellent ore to the Milwaukee rolling mills. The shaft at this mine is going down at a comparatively rapid rate, and drifting is progressing at one or more levels. The deposit is a large one, and if the coming shipping season proves to be reasonably fair, this promising new mine will make an excellent first year record.—[Florence Mining News.

The Chicago & North-Western proposes to extend its Menominee range branch this Summer from the Mansfield mine to the town of Metropolitan, on the Felch Mountain branch. The distance is about 30 miles. The Mansfield mine is located a few miles northeast of Crystal Falls, and is connected with the Menominee range line by a spur which was built last season.—[Florence Mining News.

The Chapin is shipping 500 tons of ore daily and hoisting about 1,200 tons every 24 hours.—[Florence Mining News.

The Ludington is hoisting 300 tons per day. A new shaft house is being built at B shaft. A shaft has reached a depth of 1,300 feet.—[Florence Mining News.

## The World's Money.

According to the estimates of Director Leech, of the Mint, France is the richest country in the world in specie, with a gold currency of $900,000,000 and $700,000,000 in silver. The United States comes next, with $702 000,000 in in gold and $482,000,000 of silver. Great Britain has $550,000,000 gold and $100,000,000 silver; Germany, $500,000,000 gold and $145,000,000 silver; India, $600,000,000 silver; China, $700,000,000 silver, etc. Director Leech estimates the total gold circulation of the world at $3 727,000,000, and the total silver circulation at $3,842,000,000. Of the latter $2,930,000,000 is legal tender.

THE Cleveland *Iron Trade Review* finds the advices from the leading iron centers "more reassuring." There is an increasing volume of business, an improving demand, and a firmer market, if not any advance in prices. Very good symptoms at this time of the year. The patient will be convalescent by Spring, and in robust health by midsummer.—[Marquette Mining Journal.

## CAPACITY TEST ON A HAZELTON 400 H. P. BOILER.

CHICAGO, ILL., Jan. 30, 1891.

*Hazelton Tripod Boiler Co., 170 22nd street, Chicago, Ill.*

GENTLEMEN:—In accordance with your request, I have made a test of your boiler at the works of W. H. Silberhorn, this city, to determine its evaporative capacity and quality of steam.

The boiler is rated as of 400 h. p. capacity, based upon its ability to evaporate the recognized quantity of water, viz.: 30 pounds of water per h. p. per hour from feed-water at 100 degrees and steam at 70 pounds pressure, or its equivalent of 34.47 pounds from and at 212° Fah.

Is the boiler able to do this work and deliver "dry" steam?

During the test of six hours the boiler averaged about 450 h. p. with a gradually increasing capacity toward the end of the test. A copy of the log of water consumed, is herewith furnished. The feed-water was 33° Fah., and steam pressure averaged 79 7 pounds.

The equivalent factor of evaporation to reduce to feed-water at 212°, and steam at atmospheric pressure, or 212° temperature, is found by the formula,

$$F \quad \frac{H \text{ plus } 32 - t}{966} = 1.22$$

Where $H$ = total heat of steam.

$t$ = temperature of feed-water.

The 75,600 pounds of feed-water are thus found to be equivalent to 92,232 pounds, and this divided by 34 47 gives the average h. p. as 446.

It appears that the quality of the steam was the subject of special inquiry. As you desired to have the test proceeded with at once, if possible, I concluded to use a barrel calorimeter for determining the moisture of the steam, although it is recognized by engineers to be a somewhat coarse scale for delicate measurements.

I was pleased, however, to find that you were able to secure the services of Mr. F. G. Gasche for using a Peabody wire drawing calorimeter, and hence both methods were employed. The latter instrument is very reliable, and the use of both at the same time was opportune and instructive.

The Peabody apparatus was placed in the main steam pipe, as it should be, about 20 feet from the boiler.

The barrel calorimeter received its steam from a two and one-half inch pipe, taken out of the top of the 12 inch main and running down to the floor for supplying steam to the little engines driving the automatic stokers. These pipes were all well covered, and the velocity of flow must have been small.

If the steam had been very moist in leaving the boiler, it would have had time to precipitate its water in the main steam pipe (where it was drained off by a trap) before entering the pipe leading to the calorimeter. Under such circumstances, I should hardly have expected anything else than fairly dry steam, even if quite moist when leaving the boiler, except what water may have been produced by condensation in the pipes. I thought, however, I would use the barrel calorimeter located where it was, where it could detect any very large amounts of moisture, if such there should be, which the more delicate wire drawing instrument could not measure.

The fact that both instruments showed but a small percentage of moisture is conclusive that the boiler produced what may be termed "commercially dry" steam (which is within 3 per cent. of saturation).

The fluctuations of results with the barrel calorimeter are probably occasioned more by the apparatus and its operator than by the steam. This is not an unusual occurrence in all so-called scientific experiments.

The barrel calorimeter averaged.....1.54 per cent.
The wire drawing calorimeter averaged.....1.66 per cent.

A full log of all the readings and methods of calculation accompany this report.

Mr. Gasche's report is also appended.

The customary precautions, were, of course, observed to secure reliable and reasonably accurate results, and no serious errors are believed to exist.

Respectfully submitted,

(Signed) A. F. NAGLE, M. E.

MEASUREMENT OF FEED-WATER.

Tank holds 1,800 pounds at 33° Fahrenheit. Attest, A. F. Nagle, M. E.

Total quantity pumped 42 × 1,800 = 75,600 lbs.

Factor of evaporation:

$$F = \frac{H \text{ plus } 32 - t}{966}$$

$H$ = total heat of steam = 1,180.

$t$ = temperature of feed-water 33°

$$F = \frac{1{,}180 \text{ plus } 32 - 33}{966} = 1.22.$$

Evaporation from and at 212°:

$$H.\ P. = \frac{75\,600 \times 1.22 = 92{,}232 \text{ pounds.}}{34\ 47 \times 6} = 446$$

CHICAGO, ILL., Jan. 29, 1891.

*A. F. Nagle, Esq., Mechanical Engineer.*

DEAR SIR:—Having been authorized by you, in conjunction with representatives of the Hazelton Tripod Boiler Co., of this city, and of the Silberhorn Packing House, also of Chicago, to make a careful and complete test of the "quality" of the steam as delivered from a Hazelton tripod boiler at the establishment of Mr. Silberhorn, so far as the instrumental errors of the apparatus employed will permit, I hereby submit a report upon the test that I made on Jan. 27, 1891, upon the above boiler for the object just mentioned.

The meaning of the word "quality" of steam is assumed to be that which is generally accepted in engineering literature and engineering transactions.

The apparatus employed in the experimental work is known as the throttling calorimeter, a description of which, in connection with the theory of the instrument, was presented to the American Society of Mechanical Engineers, by C. H. Peabody, and which appears in the proceedings of that society, Vols. VI, X and XI.

The gauge employed was a new one furnished by one of the interested parties. Said gauge was tested by Mr. Nagle and found to be correct.

The thermometer used was a fine grade chemical laboratory instrument, used at the Union Works of Illinois Steel Co., was furnished by the writer and is known to be accurate within half a degree Fahrenheit, having been in frequent use at the Union Works, where it is frequently compared with a Siemens standard.

The guage, on comparison with a standard (after the test) was found to be practically correct. Therefore the data herewith presented are substantially the same as those observed on the test.

C. H. Peabody, in explaining the theory of the instrument in Vol. XI of the above society's proceedings, finally evolved the following equation:

$$xr \text{ plus } q = Tc - G\,(ts - tc)$$

In which:

$x$ = part of one pound of fluid in the steam pipe that is steam, $(1 - x)$ being water ($x$ = "quality of steam").

$r$ = "heat of evaporization" of the liquid at boiler pressure.

$q$ = "heat of the liquid" at boiler pressure.

$Tc$ = "total heat" of saturated steam at the pressure in the calorimeter.

$tc$ = "temperature" of saturated steam at the pressure in the calorimeter.

$ts$ "temperature" of the superheated steam in the calorimeter.

$G$ = "specific" heat of superheated steam at a constant pressure = 0.48 nearly.

From the above quotation:

$$x = \frac{Tc - G\,(ts - tc) - q}{r}$$

By having the opening from the calorimeter chamber into the atmosphere sufficiently large, the pressure in that chamber may be conveniently assumed to be equal to the atmospheric pressure, thus avoiding the use of another pressure gauge, and at the same time rendering available the maximum range of the instrument in its moisture-measuring capacity. This method has been employed in the test of which this is a report.

As an illustration of the application of the thermo-dynamic equation giving the value of $x$ (equation 2) to the experimental data. Take the observation at 12:30 P. M. We have:

$xc$ = 1147.7 B. T. U.
$ts$ = 251° Fahr.
$tc$ = 212° Fahr.
$q$ = 294 B. T. U.
$r$ = 886 7 B. T. U.

$$x = \frac{1147.7 \text{ plus } 0\ 48\ (251 - 212) - 294}{886.7} = 0.9838 = 0\ 984 \text{ say.}$$

The same method of procedure enables one to determine the quantity of steam for any of the other sets of observations. In the above instance $1 - x$ = 0.016 or 1 and 6-10th per cent. of moisture in any unit quantity existing in the steam at that moment. Peabody's steam tables were used throughout in the computations, as in the opinion of the writer they are the most accurate steam tables available.

A sketch of the arrangement of the apparatus as used in the test is self-explanatory, the dimensions are not precise, but were adapted to the peculiar location of the instrument and are given from memory. All the exposed parts of the connections, together with the calorimeter, *were carefully wrapped with a good non-conductor* in order to reduce the radiation to a minimum. The object in adopting this form of connections was to obtain a *fair average* sample of the steam as it flowed through the pipe from the boiler.

During the first half-hour, readings of the instruments were taken every five minutes, the average quality of the steam for the interval being: $x$ = .99 or 99 per cent., and the *moisture* in the steam was: $1 - x$ = 1 per cent.

From 11 A. M. to 12 M. readings were taken at intervals of fifteen minutes, but after this time it was considered advisable to limit the intervals to ten minutes each, and they so continued for the remainder of the test.

Average quality of steam from 10:30 A. M. to 4:30 P. M. is: $x$ = 0 9834 or 98 34-100 per cent.

Signifying that the moisture in the steam was 1 66-100 per cent. or nearly dry steam.

I can truthfully say that within the limits specified, the observations were taken with the greatest care. Very respectfully,

(Signed) F. G. GASCHE, M. E.

PRIMING TEST OF STEAM WITH THROTTLING CALORIMETER BY F. G. GASCHE, M. E.

| Time, Jan. 27, 1891. | Gauge pressure correct. | Temp. *Ts.* | Quality of Steam saturation, Unity. | Per cent. of moisture. | Time, Jan. 27, 1891. | Gauge pressure correct. | Temp. *Ts.* | Quality of Steam saturation, Unity. | Per cent. of moisture. |
|---|---|---|---|---|---|---|---|---|---|
| 10-45 | 80 | 261 | .988 | 1.20 | 2- 0 | 82 | 235 | .974 | 2.60 |
| 11- 0 | 82 | 263 | .989 | 1.10 | 10 | 79 | 262 | .991 | 0.90 |
| 11-15 | 79 | 258 | .986 | 1.40 | 20 | 77 | 245 | .981 | 1.90 |
| 30 | 81 | 265 | .991 | 0.90 | 30 | 79 | 210 | .963 | X |
| 45 | 80 | 253 | .985 | 1 50 | 40 | 81 | 228 | .973 | 2 70 |
| 12- 0 | 80 | 282 | 1.000 | 0. | 50 | 80 | 242 | .978 | 2.20 |
| 10 | 80 | 271 | .995 | 0.40 | 3- 0 | 78 | 248 | .982 | 1.80 |
| 20 | 76 | 261 | .991 | 0.90 | 10 | 79 | 252 | .985 | 1 50 |
| 30 | 80 | 251 | .984 | 1.60 | 20 | 81 | 255 | .986 | 1.40 |
| 40 | 79 | 249 | .984 | 1.60 | 30 | 81 | 256 | .986 | 1.40 |
| 50 | 78 | 250 | .983 | 1 70 | 40 | 81 | 234 | .975 | 2 50 |
| 1- 0 | 79 | 238 | .977 | 2.30 | 50 | 80 | 238 | .987 | 1.39 |
| 10 | 78 | 238 | .978 | 2.20 | 4- 0 | 80 | 248 | .981 | 1.90 |
| 20 | 80 | 230 | .972 | 2 80 | 10 | 80 | 252 | .985 | 1.50 |
| 30 | 76 | 230 | .975 | 2.50 | 20 | 81 | 255 | .986 | 1 40 |
| 40 | 80 | 228 | .975 | 2.50 | 4-30 | 80 | 255 | .987 | 1.39 |
| 50 | 80 | 230 | .970 | 3.00 | Average: | | | .9834 | 1.66 |

Average moisture: 1.66 per cent. X Beyond range of instrument.

## IMPROVED WOOD-WORKING MACHINERY.

Herewith we illustrate some recent types of wood-working machinery turned out by the Indiana Machine Works, of Fort Wayne, Ind Fig. 1 shows an improved strain scroll saw, for use in planing mills, sash and door and furniture factories, pattern shops, and all places where a good, reliable, quick and convenient saw, for external and internal curved sawing may be wanted. The frame of the machine is of an improved design, is cast in one piece, is very rigid, strong, and has wide floor bearing. The table is of a good size, 32x34 inches, of alternate strips of thoroughly seasoned oak and walnut. Instead of the tight and loose pulleys, as used on most other machines of this class, an improved friction clutch pulley and combination brake is used, by which the saw may be started or stopped instantly by a single movement of the foot, and without shifting any belt, thus saving a great deal of time in changing the saw on inside work. The crank shaft is of steel, and has two self-oiling bearings, one on each side of pulley. The improved cross-head under the table, is of hard wood (maple), with adjustable guides, and is provided with a very quick and convenient catch for the saw; the saw is passed through the table and enters a strong catch which holds it firmly; requires no punching or drilling, and any width saw, or broken blades, may be used. The cross-head above the table in upper rigging, is of tool steel, and also runs in adjustable guides; the strain is very easy, regular and complete, and no jar whatever is felt when saw is running at full speed. The air pump is made a part of the frame, is out of the way, and performs the work in the best possible manner; no scroll saw is complete without a blower.

In Fig. 2 is shown a new and improved column hand planer and jointer, designed with much care, and built in four sizes, 8 12, 16 and 24 inches. The column is heavy and cast in one piece, insuring great strength and stiffness. The tables are long, being over six feet from out to out, and are easily adjusted laterally and vertically by means of the hand wheels; either or both tables can be moved back from head, without effecting height, giving free access to same for setting or whetting up the knives. The cut can be changed from nothing to ½ inch deep without stopping. For planing out of wind, making glue joints, either straight or slightly hollowing, chamfering, beveling, truing up or rabbeting, and in its adaptation to all the general requirements in sash and door, furniture, agricultural, coffin and other manufactories they have no superior. The cylinder is a solid crucible steel forging in perfect balance, and runs in long self-oiling bearings. The adjustable fence is quickly moved across the face of the table, or set to any desired bevel.

A new and improved combination rip and cross cut saw is illustrated by Fig. 3. The frame is cast in one piece, has a wide floor space, is perfectly rigid and self-contained. The swing arbors are extra heavy and strong, and revolve on a heavy steel shaft; the adjustment is simple, accurate and durable. Either saw can be so adjusted as to cut all its size will admit, or less, so that a groove of any depth can be made. The table is made in two sections, the right hand being stationary for ripping; it is provided with a very convenient and accurate fence, which may be quickly set to any position from the saw, to admit the use of a dado head.

FIG. 1.—IMPROVED STRAIN SCROLL SAW.

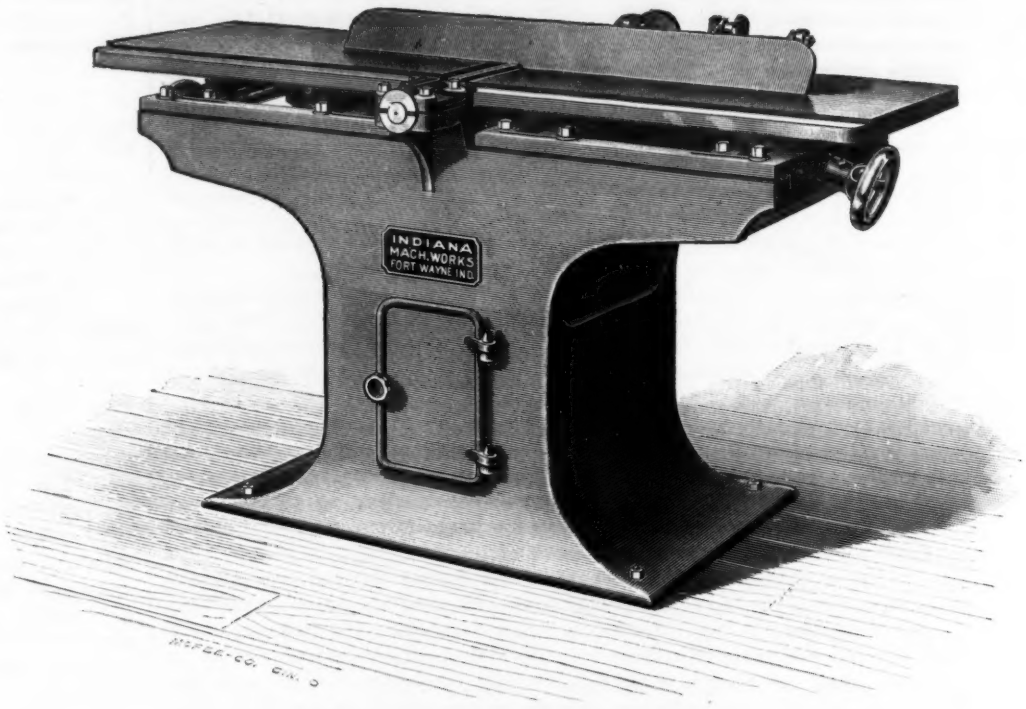


FIG. 2.—COLUMN PLANER OR JOINTER.

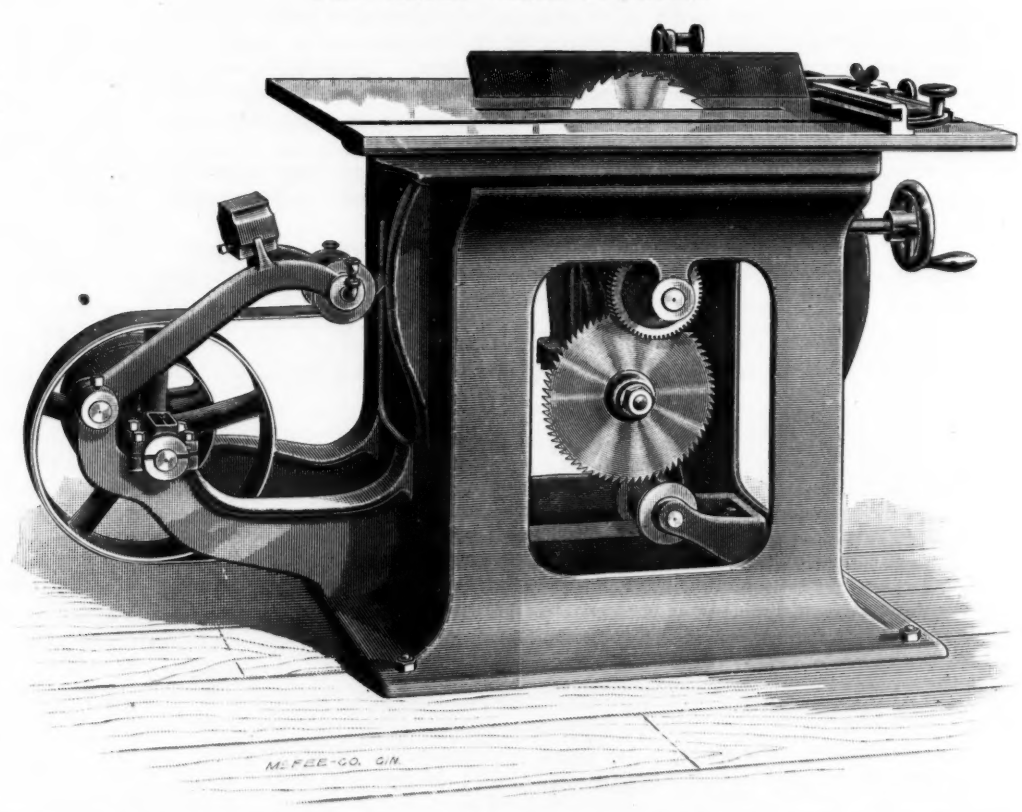

FIG. 3.—COMBINATION RIP AND CROSS-CUT SAW.

IMPROVED WOOD-WORKING MACHINERY.

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CHIEF Engineer Melville, U S. Navy, in his report of 1889, says that steel castings must be made better or abandoned for engine parts. We do not wonder much at this conclusion, considering the experience with some of the steel casting for the Baltimore. Out here the Pacific Rolling Mills Co. have had no difficulty in supplying satisfactory steel castings of all kinds for the war vessels constructed by the Union Iron Works.—[Industry, San Francisco.

## THE OFFICIAL RECOGNITION OF BASIC OPEN-HEARTH STEEL.

Quite a discussion took place recently at the Cleveland Institution of Engineers on the manufacture of basic open-hearth steel. The remarkable qualities of this material are now so well understood that the most eminent metallurgists do not hesitate to speak of it as "the metal of the future." Wherever the process has been in operation it has given unqualified satisfaction. In Austria, Germany, Hungary, Russia, and the United States basic plants are in extensive use, and their number is said to be constantly increasing. The first to erect a basic open-hearth furnace in this country, and to produce steel by this method, was, we believe, Mr. John H. Darby, of the Brymbo Steel Works, whose experiences were embodied in a paper on the subject read at one of the meetings of the Iron and Steel Institute. It is claimed for the steel produced by this process that it is admirably suited for boiler and ship-plates. Much of the discussion was confined to what may be described as the chemical aspect of the question, and but little information was given by any of the speakers as to the behavior of the steel when subjected to such treatment as would fairly test its qualities for the purposes referred to. Yet an 8-inch test-piece of this material showed that its ultimate resistance was 25 tons, and its elastic resistance 15 tons, with an elongation of 31 to 33 per cent. As Mr. Gilchrist pointed out, the Belgian State makes no discrimination between basic or any other description of steel, compliance with the official tests being the only requirement. Russia, too, acts on the same enlightened principle. The French Admiralty sanctions the use of basic steel for its boiler plates. But it is in Germany, where the basic process has attained its greatest development, that the greatest confidence, based, of course, on exhaustive tests, is felt in this material.

Our own officials, as we know, are very slow to give the stamp of their approval to any new material required for government use until it has been thoroughly tested and triumphantly emerges from all the trials to which it may have been subjected. Even then lingering doubts have been known to haunt the official mind for a long time afterwards. But the question arises, how much longer will it require to convince them that the use of basic steel for ship and boiler plates is safe and expedient? Mr. Gilchrist has no difficulty in showing that this is really a question of national importance, for at present the non-recognition, or rather the partial recognition only, of basic steel as a reliable material by the Board of Trade and the Admiralty, and also by Lloyd's, compels our makers of hematite iron to import large quantities of foreign ore (of which we should probably be deprived in case of war), and which we should no longer need if the Admiralty would accord the same rank to basic steel as is given to it in other countries. All accounts appear to agree that there has been a great improvement during the last few years in the quality of the mild steel produced by this process, and Mr. Smith Casson, of the Round Oak Works, Dudley, was able to assure the meeting that with the steel made at these works they had no difficulty in meeting the Indian State railway tests. Perhaps the most interesting speeches of the evening were those of Mr. White, the chief constructor of H. M. Navy, and of Mr. Milton, chief engineer and surveyor of Lloyd's, both of which were satisfactory so far as they go, though needlessly over-cautious in tone. Mr. White speaks very confidently of the future of basic steel, and appears to hold out the hope that the experiments and tests of that material now being made by the Admiralty would go a long way towards satisfying the desires of the co-inventors of the basic process. The fairness of the official reply was recognized by Mr. Gilchrist, who expressed the hope that Lloyd's would not relax their rules, but simply place basic on the same footing as acid steel. That this is only a question of time, and of a short time, too, the discussion leaves no doubt whatever. —[Iron and Coal Trades Review, London.

## SIMPLE METHOD OF TOUGHENING CAST IRON.

A very simple method of toughening cast iron, recently introduced by Mr. A. Jepson, of Arcade Chambers, Manchester, and which was, in the first place, designed chiefly for the bottom and side plates of ordinary ovens, has since been further developed for application to a variety of other purposes, and some brief notice of the invention will be of interest. The foundation of the patent is, that with certain proportions of thickness of wrought iron to certain proportions of thickness to cast iron, a complete fusion or amalgamation of the metal takes place without altering the consistency of the wrought iron and without chilling the cast iron, and the process is applicable to almost all cast iron in which lightness and special strength are required. For instance, a piece of cast iron ¼ inch thick, with a core of 27-inch wire gauge wrought iron perforated sheet placed in the center, is increased in strength six times, and the plate is equal to cast iron of fully an inch in thickness. Recently the process has been applied to the casting of large drain pipes to which great damage is frequently done in transit. By inserting a core of thin wrought iron into the castings of these pipes, they have been so strengthened that the liability to fracture in carriage has been reduced to a minimum. Another application of the process is for toughening the ash plates in front of boilers on board ship, these plates frequently getting nearly red hot, are consequently subject to fracture upon coming in contact with water, but by the adoption of Mr. Jepson's toughening process this danger has been entirely overcome. In the manufacture of oven plates it has been found that a thin sheet of wrought iron of 27-inch wire gauge put inside a ¼-inch plate so toughens the iron as to render the plate practically unbreakable by fire. The process has also been applied to the manufacture of the bottom plate in hydraulic presses, where the severe strain frequently causes those plates to snap in two. The process of manufacture of such plates is to place two cores of 24-inch wire gauge sheets every two inches apart through a 6-inch plate, thus forming five layers, and the additional strength thus secured is sufficient to render the press bottom unbreakable. The thin sheets used for inserting in the castings are, we learn, very fine steel or wrought iron with a thin coating of tin; and as these can be blocked into any shape, they can be readily covered by the metal in almost every form of ordinary castings.—[Glasgow Engineer.

## MUSHET'S SPECIAL STEEL.

This steel, so deservedly popular among those who perform work on metals that is severe on tools, was introduced into the United States about 20 years ago and quickly gained favor among machinists. It is particularly noted for hardness, endurance and uniformity, characteristics that have never been successfully imitated, although attempts to that end have been very persistently carried on. With tools made from this steel machinists are enabled to run their machines at a greatly increased rate of speed, and thereby turn off a very much larger amount of work in a given time than it would be possible to do with any other known steel.

The steel is made by a secret process, which produces the peculiar hard and uniform characteristics of the material. The results obtained appear to be due to manipulation alone, for the most careful chemical analyses fail to indicate wherein the mushet steel differs from many other brands of good tool steel. The steel certainly holds a very unique position among metals in respect to its constructive properties, and its well-known economic advantages. We must confess that the former interests us most, and in this connection, we recall to mind the recent words of a scientist to the writer: "We may analyze the forces of nature and to some extent harness them to our use, but could we combine them, we should be gods and not men."

This want of combination is the principle that has prevented any really successful imitation of the "Mushet's" steel; the want of combination in which the elements have especial reference to order, place and adaptability, without which the material becomes, comparatively speaking, a mere agglomeration. This idea is proved and forced upon us by the fact that many honest efforts have been made to make steel like the "Mushet's," the results of which have been that while self-hardening has been attained the displacement of elements has been such as to greatly impair its effective service, and just at this point all imitators of "Mushet" are at sea!—[Natural Gas and Locomotive Builder.

## Machinery Engineering as it Was and is Now.

Probably but few have any correct idea of the difficulties which were met with 60 or 70 years ago in making suitable tools and machinery from metal. There were no planing, boring, or shaping machines; the turning lathe and the drill-borer were about all the devices which could be called into use by the mechanic of that time. Sewing machines, which play such a part in the manufacture of shoes, could not possibly be made at that time. All inventors had to make by hand the machines they invented, without the aid of other machines in the making of the individual parts. They had to invent some tools so as to be able to make certain parts of their invented machine. When the celebrated English machinist Clement entered a shop as master at London in 1814, he found the tools so poor and defective that he had to spend days in making such tools as were needed.

James Watt, the inventor of the steam engine, could not get his first machines in working order in consequence of lack of some contrivances. The first cylinder, which he had cast was not tight and was on one end five millimeters wider than on the other. A good cylinder should not show more difference in width than ½ millimeter.

And then the cost of work at that time was extravagant. Whiteworth, one of the oldest manufacturers of working-machines in England, says, that the polishing of cast iron costed $3 per square foot 40 years ago, as the work had to be done by hand. To-day a metal-planing machine does better work for 2½ cents a square foot. The first steel pens had to be made by hand. The manufacturer Perry paid for the first steel pens $1.25 a piece. And we often read that steel pens used to cost $5. But still these pens were not as good in quality as those which are made to-day. After factories had been established, the price of a steel pen was still $1, then 50 cents and finally 25 cents, which price was kept up for some time. To-day one can get a gross for that price.—[Metal and Iron Industry.

## A "Tubulous" Boiler.

Recently a large party went to Greenwich at the invitation of Messrs. Yarrow & Co., to inspect and view a tube of their improved type of marine boiler. For some time past Messrs. Yarrow & Co. have successfully constructed locomotive boilers for torpedo boats and other forced draft vessels, but, recognizing the desire which has of late arisen for water tube boilers, the firm has for some years carefully studied the subject, and are now prepared to supply their patent tubulous boiler as an efficient steam generator suited for practical work. Yarrow & Co. have not lost confidence in the locomotive type, when properly constructed, in spite of numerous failures, doubtless due to faulty design or faulty construction. But as steam pressures gradually rise, and when that pressure has arrived at 200 lbs. per square inch or over, the question of adopting the tubulous form of boiler becomes a matter of primary consideration, on account of the comparative smallness of the parts subject to strain, and the consequent facility in designing it so as to easily withstand the increasing pressures. The vessels wherein the firm has fitted the boiler submitted for public inspection is a second-class torpedo built for the Argentine Republic, 60 ft. in length by 9 ft. 3 in. beam, having a displacement, when fully loaded, of about 15 tons, and fitted with triple-expansion surface condensing engines, capable of indicating 250 horse-power. The boat is a type whereof the firm has built a very large number, both for the British as well as foreign Governments. These boats are well known in naval circles. Their average speed, when fitted with locomotive boilers, has been 17 knots. This one, however, with the new type of boiler, realized slightly over 18 knots under precisely similar conditions of trial.—[London Iron & Steel Trades Journal.

# INDUSTRIAL SUMMARY.

New Enterprises:—

Clayton Stoner will build a machine shop at Birdsboro, Pa.

J. W. Bookwalter will build boiler works at Springfield, O., to employ 400 men.

The Smith-Hill Co., Quincy, Ill., will build an addition to their extensive machine shops.

George Baring and Oscar White are erecting and will operate an iron foundry and nail factory at St. John, N. B.

The Hazen Co., of Anderson, Ind., is now erecting an immense nail plant and contemplates the erecting of a steel billet plant.

The Bass Machine Works is the name of a concern just organized with a capital of $100,000, to build works at Grand Rapids, Mich.

Charles Tyler, of Baltimore, Md., has purchased, it is reported, and will operate the "Hope" foundry and machine shop at Fredericksburg, Va.

The Clementsport Iron Co., of Nova Scotia, is applying to the Dominion Paliament for an act of incorporation, with power to erect smelting works, etc.

At Augusta, Ga., T. F. Warwick, H. C. Perkins, A C. Brinston, and others have incorporated the Warwick Machine Co., to erect iron and brass foundry and machine works; capital stock, $12,000.

The Bristol Foundry & Machine Co. has been organized by H. T. Farnsworth, and is now erecting buildings for its foundry and machine works at Bristol, Tenn. The capital stock is $100,000.

The Jones Positive Nut Lock Co., of Chicago, has been incorporated, with a capital stock of $100,000, for the manufacture of safety nut locks and other railroad specialties; incorporators, Thomas D. Jones, Charles D. Anderson and Joseph Dirschmidt.

Galesburg Union Manufacturing Co., of Galesburg, Ill., with a capital stock of $100,000, has been incorporated to carry on a foundry, a machine shop and planing mill; incorporators, Olof Hawkinson, Aaron Linnenott, N M. Burgland and Nels Nelson.

The Royal Bridge & Iron Co., of Montreal, are applying for incorporation for the purpose of carrying on the business of constructing and designing and manufacturing iron, steel and other bridges, and of all structural iron and steel, and to deal in all kinds of structural iron, steel and other metals; capital stock, $30,000.—[The Canadian Manufacturer.

A charter of incorporation has been granted by the Government of Ontario, Canada, to Cant Bros. & Co., of Galt, under the title of The Cant Bros. Co., of Galt, Limited. The company will continue the manufacture of woodworking machinery. The capital stock is $40,000. The President is Andrew Cant, of Buffalo, and the Secretary is A. Bisset-Thorn.

Shenandoah Brass & Iron Works, at Charlestown, W. Va., capital stock, $60,000, has been incorporatorated to manufacture all kinds of brass and iron goods for plumbers', steam and gas fitters' use. The officers are Charles S. Stephens, President and General Manager; Frank Beckwith, Vice-president; John Portefield, of the Bank of Charlestown, Treasurer, and Edmond Allt, Superintendent.

Messrs. Goldie & McCulloch, Galt, Ont., will apply to the Dominion Government to be incorporated for the purpose of carrying on all or any business of manufacturers of steam engines, boilers, water wheels, heaters, pumps and all necessary parts and appliances for working the same, together with a large variety of other articles of iron and steel. Proposed capital stock is $700,000.—[The Canadian Manufacturer.

Messrs. Smith, Hudell & Liebenstein is the name of a new firm who will erect a machine shop corner Howell avenue and Schuler place, Bayview, Milwaukee, Wis. The new company will make a specialty of manufacturing the Hudell and Liebenstein patent self-loading and dumping scrapers. Besides this they will carry on a general machine and repair shop. The building will be a two-story frame structure, its dimensions being 2,200 square feet. The factory is expected to be in operation by March 5th.

The Akron Electrical Manufacturing Co., at Akron, O., has been incorporated with a capital stock of $100,000, by W. D. Chapman, F. A. Wilcox, Ed Miller, W. B. Doyle, Jr., and W. B. Gamble. The company will commence the erection of their buildings as soon as the weather will permit, and expect to start in a with a force of 50 men. The Loomis motor, fire alarm system, dynamos, signal service and general electrical supplies will form the manufactured products. The general electrical supplies will include appliances for lighting, transition of power, etc.

Additions, Enlargements, Removals, etc.:—

E. M. Cross, of Berlin, N. H., is building a foundry in connection with his machine shop.

There is a report that the Dexter Machine Co. may revive its operation in Dexter (Me.) at no late date.

The South Baltimore Car Works, Baltimore, Md., will increase its capital stock from $200,000 to $300,000.

The Arcade File Works, now located at Sing Sing, N. Y., propose enlarging the works to double their capacity.

The North Baltimore Machine Works, of North Baltimore, O., will, it is stated, remove its machine works to Ronceverte, W. Va.

The stockholders of the Oswego Foundry & Malleable Works, Oswego, N Y., have decided to increase the capital stock and put in a malleable plant.

W. H. Moffatt & Co, Rushville, Ind., machinists and dealers in brass goods, iron pipe, natural gas fixtures, etc., will increase their facilities by the erection of new buildings.

It is probable that in the near future the Chicago Tire & Spring Co., of Melrose, Ill., which employs less than 100 men, will be so enlarged as to furnish employment to 500 persons.

Barbour, Stockwell & Co., of Cambridge, Mass., manufacturers of street railway supplies, have in course of erection a machine shop, three stories in height and 150x52 feet in size, a foundry 175x75 feet, having a monitor roof, and a pattern shop 125x52 feet. The different departments will be equipped with the most improved machinery, and the old works of the company abandoned.

The Chicago & Erie Co. will erect at Hunginton, Ind., a building 250 feet long by 75 feet wide, in which to do car repairing. This will increase their force of shop hands at that point about 100 men.

The pipe manufacturing establishment of Shickle, Harrison & Howard, St. Louis, Mo., has erected branch works at Bessemer, Ala, which is turning out 200 tons of pipe per day. Its capacity is to be increased to 800 tons daily.

The East Chicago Foundry Co., whose foundry at East Chicago, Ind., was burned some months since, are rebuilding the plant and expect to have it in operation by March 15, and probably earlier. The new foundry building is 144x166 feet, and will be equipped with one 50-ton crane, two 25-ton cranes, a reverberatory furnace, and three core ovens, and will have a capacity of 100 tons a day of general castings.

The Midvale Steel Works, near Wayne Junction, Pa., will soon add to its numerous buildings an establishment for the manufacture of government ordnance. Already the firm has received a number of contracts for the casting of six, seven and eight-inch guns, and for the manufacture of armor plate for government war vessels. The Midvale works stand alone as the only estabment in the country where breech-loading steel guns are cast. Enough contracts have been secured to give employment to nearly 300 men.—[Philadelphia Record.

General Industrial Notes:—

Neshannock Furnace, at New Castle, Pa., owned by the Crawford Iron & Steel Co., made 109,790 tons of iron in 90 weeks, an average of 1,219 tons per week.

The machinery of the old Minersville Furnace, now known as the Marion Furnace, located at Minersville, Pa., and owned by the Philadelphia & Reading Coal & Iron Co., has been purchased by the Covington Iron Co., of Covington, Va.

The Neracher Sprinkler Co. report business as being very brisk, running their factory at Warren, O., day and night. They have recently closed the following contracts: The Northwestern Lumber Co., Eau Claire, Wis.; The Rust-Owen Lumber Co., Eau Claire, Wis.; Buckstaff-Edwards Co., Oskosh, Wis.; Minneapolis Flour Manufacturing Co., Minneapolis, Minn.: Illinois Glass Co., Alton, Ill.; West End Furniture Co., Rockford, Ill.; Crane Co., (Judd St. Mill) Chicago, Ill.; S D. Kimbark, Elkhart, Ind.; Overman & Schrader, Covington, Ky.; Addyston Pipe & Steel Co., Newport, Ky; The P. Echert Co., Cincinnati, O; Isaac Winkler & Bro., Cincinnati, O.; L. V. Spaulding, Haverhill, Mass., and Gale Bros., Haverhill, Mass.

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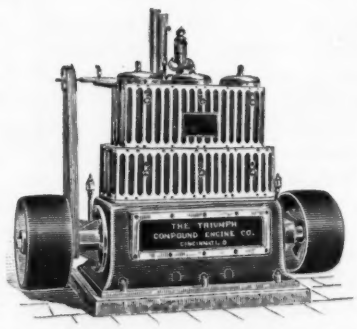


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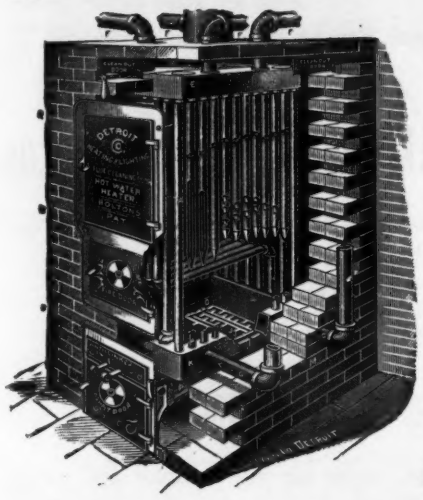

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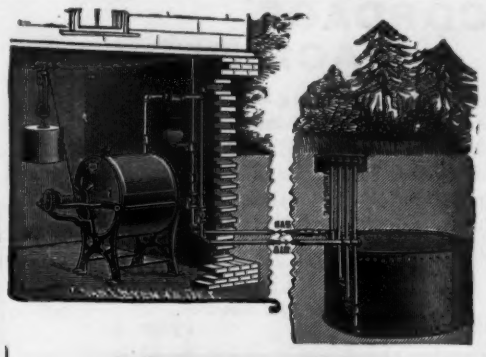

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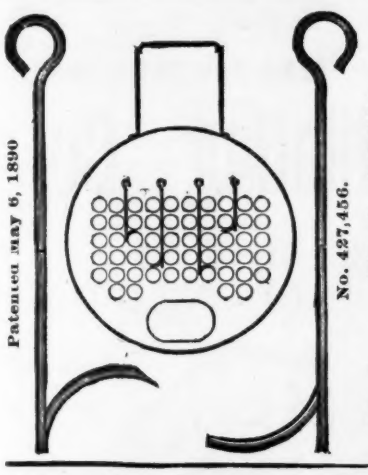


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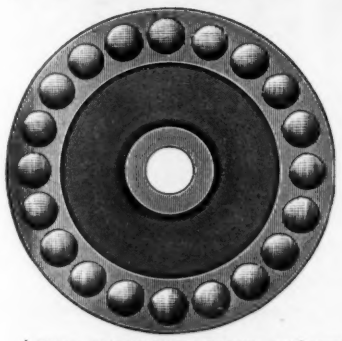

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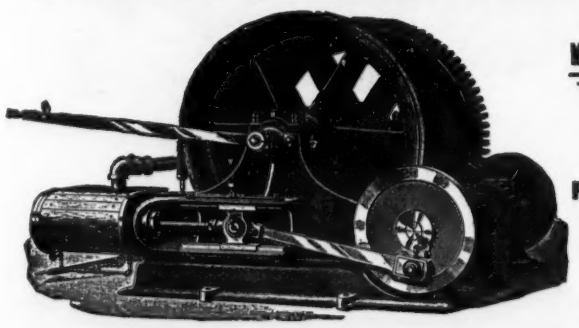

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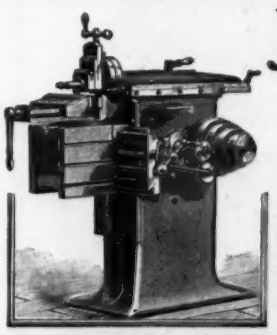

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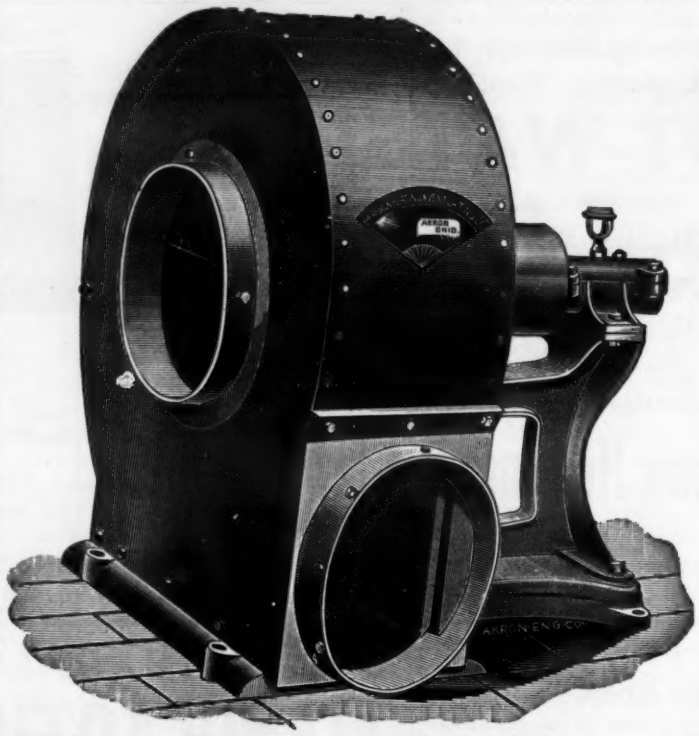

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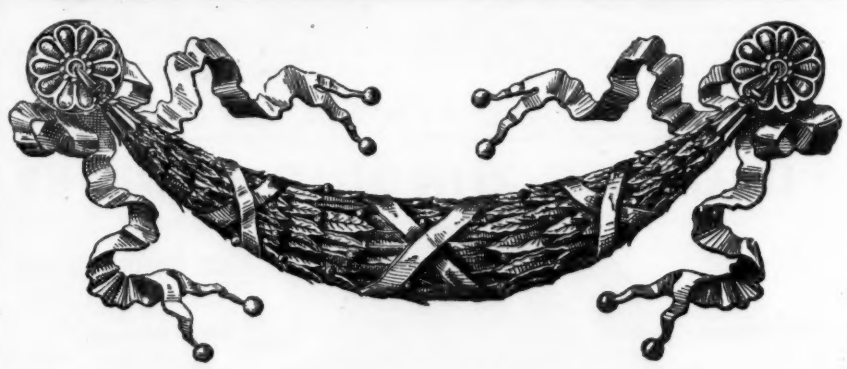

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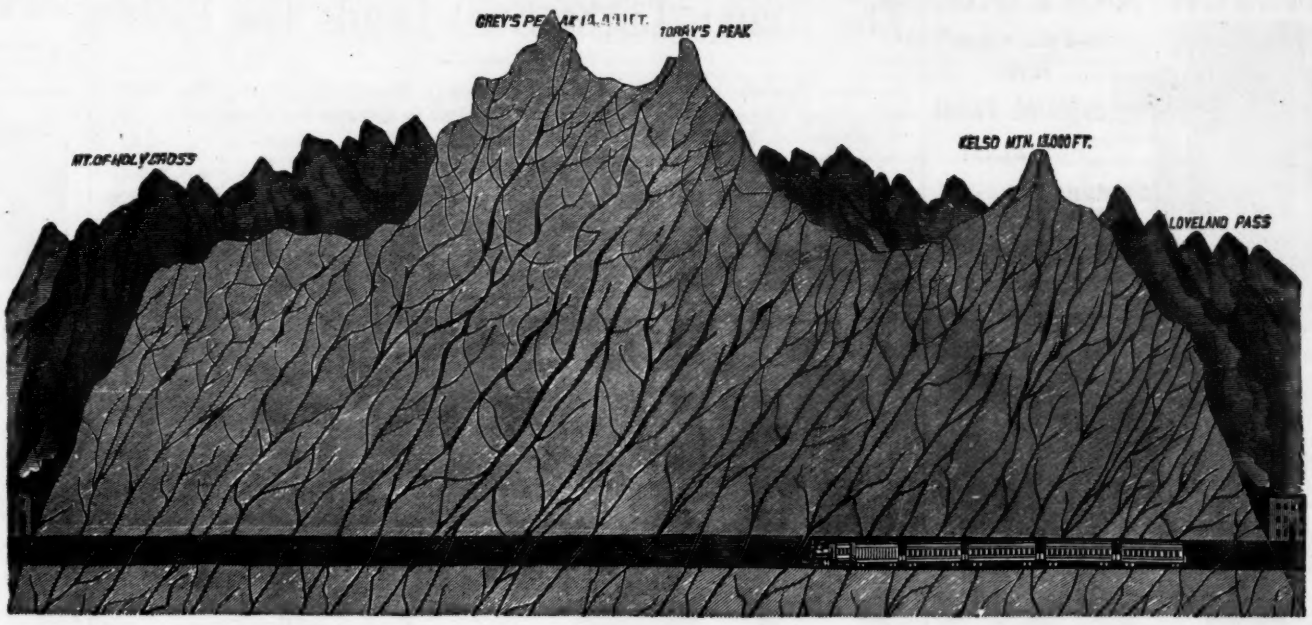
## CUTTING THROUGH THE ROCKY MOUNTAINS.




Showing what the Atlantic-Pacific Railway Tunnel Company is doing to open a tunnel or gateway through the backbone of the American Continent, so cars can run direct from Denver, Colorado, to Salt Lake City, Utah, and shorten the railway distance more than 230 miles between these two cities.

This picture shows how it is done. The object is three-fold:

1. To get access to more than 250 rich veins of gold and silver ore, that form the great mineral belt of Colorado, and that are nere found, standing as shown in the above cut. More than 250 of these fissure veins have already been discovered at the surface. They come up, following volcanic action, from the centre of the earth. From these veins thousands of tons of gold and silver ore can be brought out through the tunnel each day for market, and sold for the benefit of all who own shares issued by the Atlantic-Pacific Railway Tunnel Company.

2. To open a gateway for railway purposes through the main, snow-capped range of the Rocky Mountains, to a point 60 miles due west from Denver.

3. To open a section of conntry west from Denver, between the Rocky Mountains, comprising western Colorado and eastern Utah. This section, an area larger than the State of New York, will thus be opened to business and civilization, and made directly and easily accessible from Denver.

The cut shows the manner of getting into the hundreds of veins the tunnel is cutting through so that they can be driven into, to the right and left of the tunnel. Thus their contents of gold, silver, copper and lead, worth in cash from $100 to $3,500 per ton, can be mined out under cover the year around, dumped directly into the railway cars and run to Denver, 60 miles, direct into the smelters, without extra charge for repeated handling and wagon transportation.

These mineral bearing veins are from one to thirty feet in width. Their contents vary in thickness and quality, but the average exceeds four feet, and the average value exceeds $250 per ton.

These veins are thus opened at greater depths than any mines in the world have ever been descended into—from 1,000 to 4,000 feet below where they outcrop at the surface. Thirty per cent. of the cost of mining by the old plan of digging down into veins, pumping out water and lifting rock and ore, is thus saved by the Company.

More than 4,000 persons are now financially, jointly interested in this great enterprise. Length of tunnel from end to end, 25,200 feet. Work first begun in 1880. The Atlantic-Pacific Railway Tunnel Company became possessed by purchase in 1884. The Company owns property on which are more than 250,000 tons of low grade ore now in sight, and fully paid for. It owns several mines, claims, mill sites, and much land for town site purposes.

It has driven in at the east end into Kelso Mountain 3,000 feet, clear through the granite casing of the mountain and into the mineral grounds or veins. It has driven into the west end about 1,400 feet.

It is now taking out and shipping ore by the car load from its properties at east end of the tunnel. It has reached a two-foot wide vein of good mineral in the west end workings.

The Company is carefully organized under the laws of Colorado. All its shares are non-assessable and non-taxable. Any person can buy from the Company any number the purchaser wants and can pay for as it offers for sale. The total capitalization of the Company is $7,000,000, in 700,000 shares, par value, $10 each.

The Company is now carrying on work from the proceeds of the sale of its first mortgage bonds, par value, $250 each. These bonds pay 8 per cent. interest, and this interest is payable March 1st and September 1st each year, maturing March 1st, 1907. These bonds are a clean, clear first mortgage on all properties of the Company. They are sold as money is required for driving ahead with the tunnel. Interest from date of investment. Work goes on steadily as money is thus obtained.

The income to the Company from the sale of mineral taken from its properties will each year more than pay interest on all the bonds the Company will sell. At any time before March 1, 1893, the owner of a bond or bonds can exchange them for as many full paid, non-assessable shares as the money paid the Company for the bond would buy at $5 each, were the purchase of shares to be made now. Thus, a bond bought for $250 can be exchanged for 50 shares, and it is expected inside of three years these shares will be worth more than $20 each, and will draw from $1 to $3 or more yearly dividends each share.

In this enterprise, all stand on the same footing. Each person owning bonds will receive his interest half-yearly. The interest will be paid from the sale of ore. The Company will also have, ere long, large revenues from railway companies that will pay tollage and use the tunnel soon as completed. The Company cannot divest any person of the interests duly bought of the Company and paid for.

There is positively no chance to lose, but many to gain by purchasing bonds offered. Here is a chance to invest both money and services.

Work is going on in this enterprise constantly. None but temperance men are employed, thus ensuring more care and less liability to accidents. Positions given to investors, or, at their request, to competent persons whose services are needed as the work advances. To competent business men, financially interested, contracts will be given to open and bring ore from veins as reached by the tunnel.

The interest paid on the bonds now being sold is larger than that paid by savings banks, by their officers who, in turn, invest to larger profit. The option to exchange interest-drawing bonds for dividend-drawing shares is of itself worth as much if not more than the price paid for the bonds. For the benefit of persons disposed to economy and getting on in the world, who have not now enough on hand to buy bonds, guaranteed shares, par value, $10 each, ARE NOW OFFERED in limited number at $6 each, and each share thus sold now by the Company to bring its purchaser 50 cents a year cash, till a larger sum follows.

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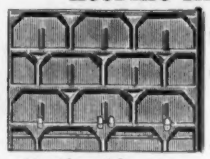

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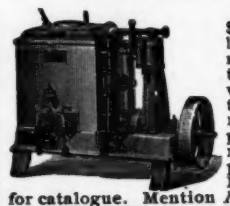

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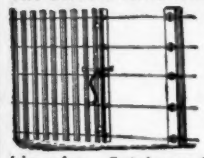

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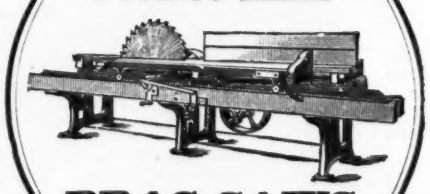

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CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1. foundry, $16 25@17 00; Southern Coke No. 2 Foundry, $15 50@16 50; Southern Coke No. 3 Foundry, $15 00@16 00; Southern Coke No 1, Softeners, $15 50@16 50; Southern Coke No. 2, Softeners, $14 75@15 50; Ohio Silveries No. 1, $18 00@18 75; Ohio Silveries No. 2, $17 00@ 17 75; Ohio Strong Softeners No. 1, $18 25@19 50; Ohio Strong Softeners No. 2, $17 50@18 75; Lake Superior Charcoal Nos. 1 to 6, $18 50@19 50; Tennessee Charcoal No. 1, $19 00@20 00; Tennessee Charcoal No. 2, $18 00@19 00; Southern Standard Car Wheel, $22 00@24 50; Tennessee Standard Car Wheel, $19 50@20 50.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $14 75@15 25; Hanging Rock Coke, No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $17 00@17 50; Tennessee Charcoal, No. 1 foundry, $16 50@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $12 25@13 00; Standard Southern Coke, mottled, $12 50@12 75; Cold Short Southern Coke, grey forge, $12 50@12 75; Strong Ohio Neutral Coke, grey forge, $14 50@15 00. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $20 00@20 50; Tennessee Car Wheel, $18 50@19 50; Lake Superior Car Wheel, $19 50@20 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $17 00@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $16 00@00 00; Ohio Softener No. 1, $17 00@00 00; Ohio Softener No. 2, $16 00@ 00 00; Jackson Co. Silveries, $18 00@00 00; Lake Superior Charcoal, $20 00@00 00; Tennessee Charcoal, $19 00@00 00; Southern Softener No. 1, $16 00@00 00; Southern Softener No. 2, $15 75@00 00; Southern Strong No. 1 Foundry, $17 00@00 00; Southern Strong No. 2 Foundry, $16 25@00 00; Alabama Car Wheel, $22 25@23 00; Hanging Rock Charcoal, $23 00@24 00

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $14 25@14 50; Southern coke No. 2, $13 75@14 00; Southern coke No. 3, $13 25@13 50; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 50@17 00; Southern charcoal, No. 2, $16 00@16 50; Missouri charcoal, No. 1, $17 50@18 00; Missouri charcoal, No. 2, $17 00@17 50. FORGE—Neutral coke, $12 50@13 00; Cold short, $12 50@13 00; Mottled, $12 00@12 25. CAR WHEEL AND MALLEABLE—Southern (standard brands), $21 00@22 00; Southern (other brands), $17 50@18 00; Lake Superior, $21 50@22 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 75@16 25; Southern Coke No. 2, $14 75@15 25; Southern Coke No. 3, $14 25@14 75; Southern Grey Forge, $13 75@14 25 Southern Charcoal No. 1, $17 50@18 00; Southern Charcoal No. 2, $17 00@17 50; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $20 50@21 00; Southern, $19 00@21 00. CONNELLSVILLE COKE—East St. Louis, $5 50; St. Louis, $5 65.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 00@19 50; Lake Superior (coke) Bessemer, $18 00@18 50; Katahdin (Maine Bessemer), $23 00@24 00; Lake Superior Coke, Foundry, all ore, $18 00@18 50; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 00@18 50; Southern No. 1 $16 00@16 25; Southern Gray Forge, $14 25@15 00; Jackson County (Ohio) Silvery, $18 25@18 75; Old Car Wheel, $00 00@00 00. Connellsville Coke, $4.65.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 00@14 50; Southern Coke No. 2 Foundry $00 00@00 00; Southern Coke No. 3 Foundry $00 00@00 00; Grey Forge, $00 00@00 00; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $17 00@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $16 25@16 75; No. 2 Foundry, $15 25@15 75; Grey Forge, $14 25@14 75; White and Mottled, $13 50@14 00; Warm Blast Charcoal, $18 00@20 00; Cold Blast Charcoal $.2 00@27 00; Bessemer, $16 00@ 6 50.

## MERCHANT IRON AND STEEL.

### Flat Bar

| | |
|---|---|
| 1¼ to 4 by ⅛ to 1 inch | 1 80 |
| 4¼ to 6 by ⅛ to 1 inch | 1 90 |
| 1¼ to 6 by 1¼ to 2 inch | 2 20 |
| 1¼ & 1⅜ by ⅛ to ¼ inch | 1 90 |
| 1 & 1⅛ by ⅛ to ¼ inch | 2 00 |
| ⅛, ¼ and ⅜ by ⅛ to ½ inch | 2 20 |

### Round and Square.

| | |
|---|---|
| 1 to 1⅜ inch | 1 80 |
| 2 to 2⅜ inch | 2 00 |
| 2⅜ to 3¼ inch | 2 0 |
| 3⅜ to 4 inch | 2 80 |
| 4⅛ to 4¾ inch | 3 50 |
| 4¾ to 5 inch | 3 50 |

### Oval.

| | |
|---|---|
| ⅜ to 1¼ inch | 2 20 |
| ⅜ to ¾ inch | 2 00 |
| ½ | 2 60 |
| ¾ | 3 00 |

### Half Oval and Half Round.

| | |
|---|---|
| 1¼ to 3 inch | 2 90 |
| ⅜ to 1¼ inch | 2 50 |
| ⅜ to ¾ inch | 3 10 |
| ½ | 3 10 |
| ¾ | 4 80 |

### Heavy Band.

| | |
|---|---|
| ¼ to 6 by ¼ and 5-16 inch | 2 00 |
| to 1¾ by ¼ and 5-16 inch | 2 10 |
| ⅜ to ⅝ by ¼ and 5-16 inch | 2 30 |
| ⅛ to ⅜ by ¼ and 5-16 inch | 3 80 |

### Hoops.

| | |
|---|---|
| 1¼ to 4, Nos. 13 to 15 | 2 60 |
| 1¼ to 2, Nos. 16 to 18 | 2 70 |
| 1¼ to 2, No. 19 | 2 80 |
| 1¼ to 2, No. 20 | 2 90 |
| 1¼ to 2, No. 21 | 3 00 |
| 1¼ to 2, No. 22 | 3 10 |
| 15-16, 1 and 1⅛, Nos. 13 to 15 | 2 80 |
| 15-16, 1 and 1⅛, Nos. 16 to 18 | 2 90 |
| 15-16, 1 and 1⅛, Nos. 19 and 20 | 3 00 |
| 15-16, 1 and 1⅛, No. 21 | 3 10 |
| 15-16, 1 and 1⅛, No. 22 | 3 20 |
| ⅞, Nos. 13 to 15 | 3 00 |
| ⅞, Nos. 16 to 18 | 3 10 |
| ⅞, Nos. 19 and 20 | 3 20 |
| ⅞, No. 21 | 3 30 |
| ⅞, No. 22 | 3 40 |
| 13-16, Nos. 13 to 15 | 3 20 |
| 13-16, Nos. 16 to 18 | 3 30 |
| 13-16, Nos. 19 and 20 | 3 40 |
| 13-16, No. 21 | 3 50 |
| 13-16, No. 22 | 3 60 |
| ¾, Nos. 13 to 15 | 3 30 |
| ¾, Nos. 16 to 18 | 3 50 |
| ¾, Nos. 19 and 20 | 3 60 |
| ¾, No. 21 | 3 70 |
| ¾, No. 22 | 3 80 |
| 11-16, Nos. 13 to 15 | 3 50 |
| 11-16, Nos. 16 to 18 | 3 60 |
| 11-16, Nos. 19 and 20 | 3 80 |
| 11-16, No. 21 | 3 90 |
| 11-16, No. 22 | 4 00 |
| ⅝, Nos. 13 to 15 | 3 60 |
| ⅝, Nos. 16 to 18 | 4 00 |
| ⅝, Nos. 19 and 20 | 4 10 |
| ⅝, No. 21 | 4 20 |
| ⅝, No. 22 | 4 30 |
| ⅝, No. 23 | 4 50 |

### Light Band.

| | |
|---|---|
| 1¼ to 6 by ¼ to 3-16 in | 2 20 |
| 1¼ to 6 by Nos. 11 and 12 | 2 30 |
| 1 to 1¾ by ¼ to 3-16 in | 2 40 |
| 1 to 1¾ by Nos. 11 and 12 | 2 50 |
| ⅜ and 13-16 by ¼ to 3-16 in | 2 70 |
| ⅜ and 1 3-16 by Nos. 11 and 12 | 2 80 |
| ¼ and 11-16 by ¼ to 3-16 in | 3 00 |
| ¼ and 11-16 by Nos. 11 and 12 | 3 10 |
| ⅛ and 9-16 by ¼ to 3-16 in. | 3 20 |
| ⅛ and 9-16 by Nos. 11 and 12 | 3 40 |
| ⅛ by ¾ to 3-16 in | 3 60 |
| ⅛ by Nos. 11 and 12 | 3 70 |

### Wagon Box Iron.

| | |
|---|---|
| ⅛ inch, beveled edge, by Nos. 11 and 12 | 2 80 |
| ⅛ inch, " " " 13 and 14 | 3 00 |
| ¼ inch, " " " 11 and 12 | 3 10 |
| ¼ inch, " " " 13 and 14 | 3 30 |

### Sheet Iron.

| | |
|---|---|
| No. 10 to 14 | 2 65 |
| No. 15 to 17 | 2 75 |
| No. 18 to 21 | 2 90 |
| No. 22 to 24 | 3 15 |
| No. 25 to 26 | 3 30 |
| No. 27 | 3 40 |
| No. 28 | 3 50 |

### Iron Boiler Plates.

| | |
|---|---|
| Tank, ¼ inch and heavier | 2 60 |
| C No. 1, " " | 2 85 |
| C H No. 1 " " | 3 10 |
| C H Flange, " " | 3 85 |
| Extra Flange, " | 4 35 |
| Solid Fire Box " | 5 10 |

### Steel Boiler Plates—1-4 in. and Heavier.

| | |
|---|---|
| Tank | 2 75 |
| Shell | 3 15 |
| Flange | 3 45 |
| Marine Flange | 3 85 |
| Fire Box | 4 55 |

Above includes plates 90 inches wide.

| | |
|---|---|
| 90 to 96 in. wide | ½c lb extra |
| 96 to 100 in. wide | 1 c " |
| 100 to 104 in. wide | 1½c " |
| 104 to 116 in. wide | special |

### American Cast Tool Steel.

| ROUND, SQUARE AND OCTAGON. | cts. lbs |
|---|---|
| 1 to 2 in. inclusive | 09 |
| 9-16 to ⅞ in " | 09 |
| 7-16 to ⅝ and 2⅝ to 3 in | 10⅝ |
| 3⅛ to 4 in | 11 |
| ⅝ to 11-16 and 4⅛ | 10⅝ |
| ⅝ to 6 in | 11⅝ |
| ¼ to 9-32 and 6⅝ to 7 in | 12 |
| 3-6 in | 14 |

### Flats.

| | cts. lbs |
|---|---|
| 2 to 9-16 wide by 2 to ⅛ thick | 9 |

### Bessemer and O. H. Steel.

| | | |
|---|---|---|
| Machinery | base price, | 2 75 |
| Tire | " | 2 75 |
| Spring | " | 3 25 |
| Sleigh Shoe | " | 2 75 |
| Toe Calk | " | 3 00 |
| Cutter Shoes, tapered and burr. | " | 3 00 |

### English Tool Steel.

| | |
|---|---|
| Jessop's | 16c |
| Hobson's "Best" | 16c |
| " "Choice" | 36c |

### Burden Boiler Rivets.

| | |
|---|---|
| ⅛, ⅜, 11-16 and ¾ inches diameter | 4 00 |
| Bridge ⅛, ⅜, 11-16 and ¾ inch diam | 4 00 |

## SCRAP IRON AND OLD METAL.

| | NET TONS |
|---|---|
| No. 1 R. R. wrought scrap | $19 00 |
| No. 1 wrought scrap | 17 00 |
| No. 1 Machine cast scrap | 12 00 |
| Iron axles | 24 00 |
| Axle turnings | 13 50 |
| Wrought turning (free from cast) | 12 00 |
| Cast borings | 8 00 |
| Uncut wrought iron boilers | 11 00 |
| Steel boiler plates | 17 00 |
| Grate Bars | 8 00 |
| Pipes and flues (Clean) | 13 50 |
| Tank iron | 13 50 |
| Hoop and band iron | 10 00 |
| Sheet iron | 9 50 |
| Wrought drillings | 11 00 |
| Malleable iron | 10 00 |

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

| | |
|---|---|
| Railroad Wrought | $20 00 |
| No. 1 Country Wrought | 17 00 |
| Stove Plate | 8 75 |
| Machine Castings | 11 00 |
| Hoop and Sheet | 8 00 |
| Casting Borings | 9 00 |
| Wrought Turnings | 12 00 |


**CLEVELAND ROLLING MILL CO.,**

MANUFACTURERS OF

**BESSEMER STEEL RAILS,**

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

**THE CAMBRIDGE IRON & STEEL CO.**

MANUFACTURERS OF

**SHEET IRON AND SHEET STEEL**

Squared Roofing Sheets a Specialty.

CAMBRIDGE REFINED IRON. TRADE MARK

CAMBRIDGE SOFT STEEL. TRADE MARK

CAPACITY RANGES FROM No 30 26 INCHES WIDE TO 1-4×40×120

CORRESPONDENCE SOLICITED

OFFICE AND WORKS CAMBRIDGE, OHIO.

**Magnetic Concentration of Iron Ore.**

**Ball-Norton (Monarch) Electro Magnetic Separator.**

Phosphorus, sulphur, silica, hornblende and other impurities eliminated from Iron Ore, and non-Bessemer ore converted into Bessemer Ore. Samples treated without charge. Correspondence solicited.

**H. E. COLLINS & CO., Agents Magnetic Separator Co.,**

BANK OF COMMERCE BUILDING, PITTSBURGH, PA. ALDRICH COURT, 45 BROADWAY, NEW YORK

**Cleveland Iron Mining Co.,**

Mercantile Bank Building,

CLEVELAND, O.

Organized 1850.

Total Production to Date, 4,200,000 Gross Tons.

Dealers in Lake Superior iron ore from their own mines at Ishpeming, Mich.

Specially adapted for making strong, tough iron, and for carrying large proportions of mill cinder and cold short ores.

**DALLIBA, CORRIGAN & CO.,**

DEALERS IN

**Iron Ore & Pig Iron,**

Rooms 716, 717, 718, 719 Perry-Payne Bld'g,

CLEVELAND, O.

**OGLEBAY, NORTON & CO.,**

Successors to Tuttle, Oglebay & Co.,

Commission Dealers in

**Iron - Ores,**

FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS,

CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.

**J. H. OUTHWAITE & CO.,**

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

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Perry-Payne B'ld'g. Cleveland, O.

**THE CONDIT-FULLER CO.,**

**Pig and Bar Iron,**

CLEVELAND, OHIO.

**E. C. POPE,**

COMMISSION DEALER IN

**Iron Ore, Pig Iron**

AND METALS.

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**PITTSBURGH & WHEELING COAL CO.,**

MINERS AND SHIPPERS OF

**Ohio Steam Coal and Coke.**

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

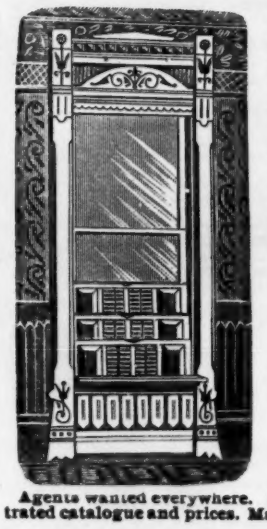
Office, 6 Mercantile Bank Building,

CLEVELAND, OHIO.

Lake Shipping Point, Lorain O

JAS. PATTERSON, Sales Agent.

**Hartman's Patent Inside Sliding Window Blind**



is the most popular Blind in America. Architects & builders prefer it to any other, for merit, style, convenience and economy.

Not Complicated.

The Only Blind that is furnish'd with an automatic Burglar-Proof Lock, free of charge. This is an item of immense magnitude, and may save you many times the cost of blinds & perhaps life also, and the only blind that gives entire satisfaction. Thousands are in use.

Agents wanted everywhere. Send for illustrated catalogue and prices. Manufactured by

HARTMAN & DURSTINE, No. 59 Beaver St. Wooster, O.

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Brand new. Cheap. Address,

LUBRICATOR,

Care Iron Trade Review.

ESTABLISHED 1854.

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Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus st. Factories on Columbus, Winter and Leonard streets.

Cleveland, O., U. S. A.

COWLES

**Pure Aluminum**

$1.25 PER POUND.

Quality guaranteed equal to any on the market. Manufactured by

**The Cowles Electric Smelting & Aluminum Co.,**

LOCKPORT, N. Y.

Also manufacturers of

Cowles Aluminum Bronze,
Cowles Aluminum Brass,
Cowles Silver Bronze,
Cowles Silicon Bronze,
Cowles Aluminum Iron

INGOTS AND CASTINGS.

☞Correspondence olicited.

# MACHINERY SUPPLY MARKET.

**Anvils.**

American ..... ₩ lb 9@10
Wrights ..... " ₩ 12

**Bellows.**

Blacksmiths' { Hill's ..... dis 40 / Bullock's ... dis 50&10
Moulders' ..... dis 40@40&10
Hand ..... dis 40&10@50

**Belting.**

Boston Belting Co's standard ..... dis 70
" " " extra ..... dis 60&5
" " " best ..... dis 55
Hoyt's Short Lap ..... dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single, ..... dis 40
Shults Raw Hide Leather Belting, double, and Light Double ..... dis 40
Standard, oak tanned ..... dis 50@60
Alexander Brothers' pure oak tanned. ...dis 45

**Blowers and Exhausters.**

B. F. Sturtevant's ..... dis 20
Boston Blower Co., ..... dis 35
Buffalo ..... dis 35

**Borax.**

..... ₩ lb 9¼@10¼

**Chalk.**

White ..... ₩ gross 50
White Crayon ..... ₩ gross 12@12½ dis 10
Red ..... dis 70
Blue ..... dis 85

**Chucks.**

Cushman's 4 Jaw Independent ..... dis 45
" Combination ..... dis 40
" Geared Scroll ..... dis 30
" 2 Jaw Brass Workers ..... dis 30
" Drill ..... dis 35
Wescott's Scroll Combination ..... dis 33⅓
" Independent ..... dis 40
" Little Giant Drill ..... dis 30
Horton's Universal ..... dis 40
" Independent ..... dis 45
Whiton's Independent ..... dis 45
National Combination ..... dis 40
Sweetland " ..... dis 40
Almond Drill ..... dis 20
Morse " ..... dis 15
Skinner's Combination Lathe ..... dis 33⅓
" Independent Lathe ..... dis 40
" Universal Lathe ..... dis 40
" Drill ..... dis 15

**Cutters and Reamers.**

Cleveland ..... dis 10@15
Pratt & Whitney ..... dis 10@15
Standard ..... dis 10@15
Brown & Sharpe, Milling Cutters ..... dis 15
" Gear Cutters ..... dis 15

**Crowbars.**

Cast Steel ..... ₩ lb 4
Iron, steel points ..... ₩ lb 3¼

**Drill and Drill Sockets.**

Twist drills ..... dis 50&10
Morse Taper and Straight shank to 1⅛" ..... dis 50&10
Morse Taper and Straight shank Larger than 1⅛" ..... dis 25
Drill Sockets ..... dis 25
Standard Twist Drills ..... dis 55@55&5
Cleveland " " ..... dis 55@55&5

**Emery.**

| | No. 4 to 46 gr. | No. 54 to 150. gr. | Flour, F. | C. F. FF. |
|---|---|---|---|---|
| Kegs, ₩ lb | 4 c | 5 c | | 2½c |
| ¼ kegs ₩ lb | 4¼c | 5¼c | | 2¾c |
| ⅛ kegs ₩ lb | 4½c | 5½c | | 3 c |
| 10 lb cans, 10 in case | 6 c | 6¼c | | 3 c |
| 10 lb cans, less than 10 | 10 c | 10 c | | 7½c |

**Emery Cloth and Paper.**

Barder, Adamson & Co. ..... dis 45@50
H. H. Barton ..... dis 50@5c&5

**Emery Wheels.**

Detroit ..... dis 55@60
Norton's ..... dis 55@60
Grant ..... dis 55@60
Sterling ..... dis 60
Celluloid ..... dis 10&33⅓
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60
Vulcanite ..... dis 10&10

**Files.**

Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
Arcade ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros. Hand Cut ..... dis 60
Industry File Works, hand cut ..... dis 50

**Hammers.**

P. S. W. ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs 18c over 5 lbs 14c, new list.

**Jack Screws.**

Illinois Bolt Co. list ..... dis 70

**Nuts and Washers.**

| Size of bolt inches | ⅛ | 5-16 | ⅜ | ½ | ⅝ | ¾ | 1 |
|---|---|---|---|---|---|---|---|
| Square | 8 | 7 | 5¾ | 4¾ | 4 | 3½ | 3⅛ |
| Hexagon | 15⅝ | 11⅜ | 8⅝ | 6 | 5¼ | 5⅛ | 5 |
| Washers | 9 | 8 | 7 | 5 | 4½ | 4⅜ | 4⅛ |

In lots less than 100 lbs, ₩ lb add ½c., lb boxes add 1c to list.

**Nails (wire.)**

List July 14, 1887 ..... dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots ..... $2.30 / Less than car lots $2.40

**Oilers.**

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz ..... dis 10@10&10

**Packing, Steam.**

Boston Belting Co. ..... dis 60
American Packing Hemp ..... ₩ lb 10@11
Russia Packing " ..... ₩ lb 14
Italian Packing " ..... ₩ lb 13@14
Plumbago Piston ..... ₩ lb 48
Morrison's " ..... ₩ lb 50
Square Flax " ..... ₩ lb 50
Sheet Rubber ..... ₩ lb 12&24
Excelsior Rubber ..... ₩ lb 48

**Picks.**

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

**Pulleys.**

Iron Pulleys, Walker List ..... dis 45
Medart Pulleys ..... dis 55
Split Wood Pulleys ..... dis 50@55

**Rivets.**

Iron, Thousand, list November 17, ..... dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17 ..... dis 50
Copper ..... dis 50@50&10

**Rope.**

Manilla, ¼ inch and over ..... ₩ lb 15¾
Sisal, ¼ inch and over ..... ₩ lb 13¾

**Sand Paper.**

B. A. & Co ..... dis 45@50
H. H. Barton's ..... dis 40@45
New England Flint ..... dis 40@50
Barton's Garnet ..... dis 20

**Saws.**

Disston's Circular ..... dis 40@45
" Band ..... dis
" Scroll ..... Net
Hack Saw Stubs ..... dis 20
" " Eureka ..... dis 20
" " Star ..... dis 20
Saw Swages Disston's ..... dis 20
Atkins' Cicular Saws ..... dis 40&45
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws ..... dis 40&10
" Silver Steel Diamond Cross-cut Saws ..... dis 70c per ft
" Dexter Cross-cuts ..... dis 50c "
" Diamond " ..... dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts ..... dis 32c "
No. 1 Handles ..... dis 23c per pair
No. 6 " ..... dis 16c "
Excelsior Saw Tools ..... $6 per doz
Perfection " ..... $15 "
Detroit Saw Works, Circular ..... dis 50
" " " Band ..... dis 25
" " " Mulay ..... dis 45

**Screws.**

Wood Screws—List Jan 27, 1889

Flat head iron ..... dis 50
Round head iron ..... dis 40
Flat head brass ..... dis 45
Round head brass ..... dis 35
Square Cap ..... dis 65
Hexagon Cap ..... dis 60
Set C. H. C. P ..... dis 70
Machine, flat head, iron ..... dis 65
Machine, round head, iron ..... dis 60
Bench and hand—
Lag or coach ..... dis 75@75&10
Coach, patent gimlet point ..... dis 75

**Shovels and Spades.**

Ames' list November 1, 1885 ..... dis 20
Dennis ..... dis 5.25
Hussey & Binns, railroad ..... dis 8.00

**Taps.**

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps ..... dis 50
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 50
Pulley Taps ..... dis 40

**Twine.**

| | BC. | B. |
|---|---|---|
| No. 12, Flax Twine, ¼ and ⅜ lb Balls | | 21C@29C |
| No. 18 " " ¼ and ½ " | | 18c@28c |
| No. 36 " " ¼ and ½ " | | 16c@27c |
| 2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine) | | 11½c |
| 3-Ply " 1 lb Balls | | 12@12½c |
| 3-Ply " 1½ lb Balls | | 11@11½c |
| Cotton Wrapping, 5 Balls to lb | | 15@16c |

**Vises.**

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 10@15
Howard ..... dis 30

**Wire.**

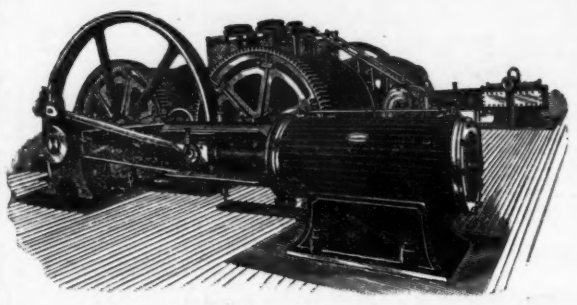
New List, Jan. 18, 1884

Brass and copper ..... dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... $6.00@lb dis 3

**Wrenches.**

Coe's genuine, ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanics' ..... dis 55&10,& 3
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 10
William's " " ..... dis 10
Alligator " " ..... dis 40


## Webster, Camp & Lane Machine Co.



MANUFACTURERS OF

**Mining Machinery,**

Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.

Wire Rope Haulage Machinery,

Endless or Tail Rope Systems.)

CORNISH PLUNGER AND BUCKET LIFT PUMPS.

**Automatic or Slide Valve Steam Engines, Sheaves, Cages, Buckets, Etc.**

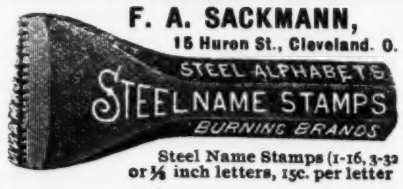
Send for Catalogue D. 134 N. Main St., AKRON, OHIO.

**THE GUM ELASTIC ROOFING**

IS ABSOLUTELY NON-COMBUSTIBLE. If painted it is Guaranteed to last 10 years. Costs only $2.00 per 100 square feet. Strongly endorsed by New York Board of Underwriters. Just the article for the South. Send stamp for circulars, samples and particulars.

**GUM ELASTIC ROOFING CO., 41 West Broadway, New York City.**

**THE THOS. D. WEST FOUNDRY, CO.**
CLEVELAND, O.
LIGHT AND HEAVY
**IRON CASTINGS.**
DAILY MELTING CAPACITY 75 TONS—SPECIAL FACILITIES FOR ECONOMICALY TURNING OUT SMOOTH CLEAN CASTINGS.
DUPLICATE WORK A SPECIALTY




**F. A. SACKMANN,**
15 Huron St., Cleveland. O.
Steel Name Stamps (1-16, 3-32 or ⅛ inch letters, 15c. per letter

**PATENTS**

**WM. M. MONROE,**
SOLICITOR & COUNSELLOR, City Hall Room 48.

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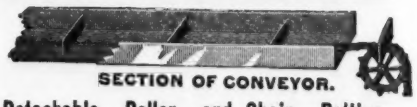

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**Detachable Roller and Chain Belting,**

CHAIN.

MADE IN ALL SIZES OF

Malleable Iron and Steel,

DESIGNED FOR

**Elevators, Conveyors, Drive Belts, etc.**

For handling materials of all kinds.

Send for Illustrated Catalogue. Address

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**STEEL CASTINGS**

**FROM 1-4 TO 15,000 LBS. WEIGHT.**
True to pattern, sound, solid, free from blow-holes and of unequaled strength.
Stronger and more durable than iron forgings in any position, or for any service whatever.
60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.
Crossheads, Rockers, Piston-Heads, etc., for Locomotives. STEEL CASTINGS of every description.
Send for circulars and prices to
**Chester Steel Castings Co.,**
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**"Treated" COTTON, Rubber Lined**
**Fire and Mill Hose.**
**Fabric Fire Hose Co.,**
13 and 15 Park Row, NEW YORK, N. Y.

THE BRIGHTMAN STOKER IS THE BEST
STEAM BOILER FURNACE IN THE WORLD.
SEND FOR DESCRIPTIVE PAMPHLET. THE BRIGHTMAN STOKER CO. 201-203 RIVER ST. CLEVELAND, OHIO.

## HARDWARE MARKET.

### Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

### Axes.

Makers' and Special Brands—
First quality.....℔ doz $8 00
Others.....℔ doz $7 00
Full polished.....℔ doz $9 00

### Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&10&5
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

### Buckets, Elevator.

.....dis 50&10

### Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&10
Loose joint, jap.....dis 70&10
Loose joint, jap. with acorns.....dis 70&10
Loose pin, acorns.....dis 70&10
Loose pin, japanned acorns.....dis 70&10
Loose pin, acorns, jap. plated tips.....dis 70&10
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10
Wrought, fast joint, broad.....dis 70&10
Wrought, loose joint, broad.....dis 70&10
Table Butts, back flaps, etc.....dis 70&10
Regular inside blind.....dis 70&10
Light inside blind.....dis 70&10
Loose pin.....dis 70&10
Light loose pin.....dis 70&10

### Carbonized Felt and Building Papers.

(POWERVILLE BRAND.)

| | Per roll of 500 sq. feet. |
|---|---|
| Eberts Bros., Detroit. | |
| No. 1—Slaters'.....| $1.25 |
| "A," Stringed Roofing, Light.....| 1.50 |
| "B," Stringed Roofing, Medium.....| 1.75 |
| "C," Stringed Roofing, Heavy.....| 2.00 |
| Stringed, Rosin-Sized.....| 1.00 |

MILCELLANEOUS.

Asphaltum, Trinidad Refined, ℔ ton.....$30.00
Asphaltum, Fine Grade, ℔ lb.....08
Coal Tar Felt, 1 Ply, ℔ lb.....02
Coal Tar Felt, 2 Ply, ℔ roll 108 sq ft.....1.42½
Coal Tar Felt, 3 Ply, ℔ roll 108 sq ft.....1.85
Roofing Pitch, ℔ gal.....09

### Chains.

Revised List.

Trace, 6½-10-2.....℔ pair 1.03
Trace, 6½-10-3.....℔ pair .92 } .....50&10
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....℔ lb 5½@6
Jack Chain, Iron.....dis 75&10
Jack Chain, Brass.....dis 75

### Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

### Cutlery.

Table.....net
Excelsior Pocket.....net

### Fibre Ware—Standard.

| | Nos. 1 | 3. | 5X. |
|---|---|---|---|
| Pails, water, 12 qt | $4 00 | $4 50 | $..... |
| Dairy, 14 qt | 4 50 | 5 00 | ..... |
| Fire 12 qt | 5 00 | ..... | ..... |
| Sugar | 6 00 | 6 50 | ..... |
| Horse | ..... | 5 00 | ..... |
| Buggy | 4 00 | ..... | ..... |
| Chamber, Slop, Commode } 5 and 5X 14 qt | 6 50 | 7 50 | 8 50 |
| Fare, slop, 5 and 5X 14 qt | 8 00 | 9 00 | 10 00 |
| Basins, wash— | | | |
| 10¾ inch | 2 00 | 2 25 | ..... |
| 12 inch | 2 25 | 2 75 | 3 25 |
| 13¾ inch | 2 75 | 3 25 | 3 75 |
| 15 inch | 3 25 | 3 75 | 4 25 |
| Bowls, fruit | ..... | 2 50 | ..... |
| Servers, 12 in | ..... | 2 25 | ..... |
| Baskets, waste paper, 13 in | ..... | 6 00 | ..... |
| Spittons, "Daisy," pressed | | | |
| 8 inch | 4 00 | 4 50 | 5 00 |
| 10 and 11¾ inch | 6 00 | 6 50 | 7 50 |

No. 1 plain; No. 5 decorated; No. 5X White decorated.

### Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....℔ gross $12, dis 25@25&5

### Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 33—
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

### Horse Nails.

| No. | 10 | 9 | 8 | 7 | 6 | |
|---|---|---|---|---|---|---|
| Ausable, ℔ M. | 23 | 24 | 25 | 26 | 28 | dis 40 |
| Putnam, ℔ M. | 18 | 19 | 20 | 21 | 23 | dis 15 |
| Essex | | | | | | dis 25&10 |

### Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

### Knobs.

Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

### Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60&10
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Padlocks and padlock keys.....dis 75
Bell pulls, mineral, porcelain and jet dis 60&10
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

### Plumbs and Leve s.

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Pocket levels.....dis 70&10
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### Pumps.

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### Pokes, Animal.

Bishop's I. X. L.....℔ doz $6 00
Bishop's O K.....℔ doz $5 25
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Wostenholme & Butcher.....$10@¼...dis 10
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Hatch, Tea, No. 167.....℔ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1887.....dis 50&10@50&10&4

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Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....℔ doz $18 dis 25

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Winterbottom's try and miter.....dis 30&10

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New List, Oct. 19, 1890.

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Steel carpet tacks all kinds.....dis 75&10
Swedes iron carpet tacks, all kinds.....dis 75&10
Swedes iron tacks.....dis 75&10
Swedes iron Upholsterers' tacks.....dis 75&10
Tinned Swedes iron tacks.....dis 77½&10
Tinned Swedes iron Upholsterers' tacks.....dis 77½&10
American iron cut tacks.....dis 77½&10
Copper tacks.....dis 4 &10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 60&10
Finishing nails.....dis 60&10
Hungarian nails and miners' tacks...dis 60&10
Gimp and lace tacks.....dis 77½&10
" " " tinned.....dis 60&10
Trunk and clout nails.....dis 72½&10
Tinned trunk&clout nails.....dis 66&10
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Chair nails.....dis 66&10
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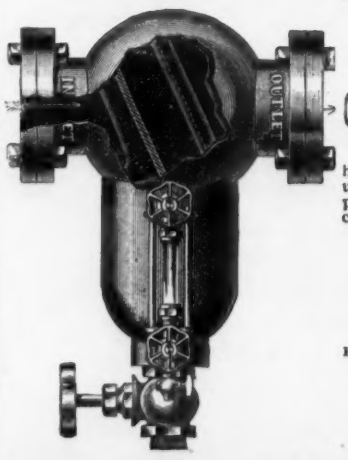

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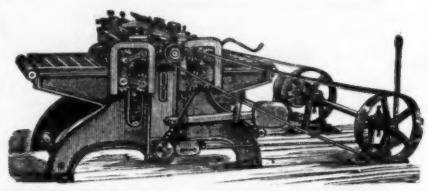

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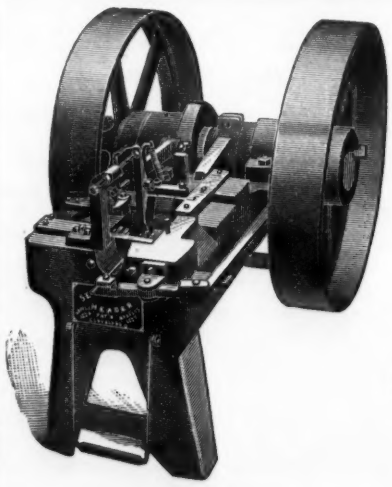

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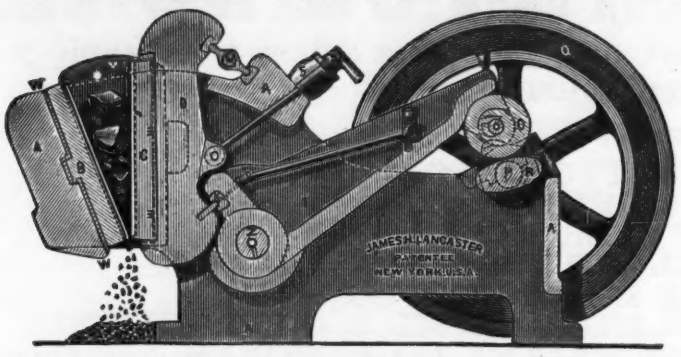


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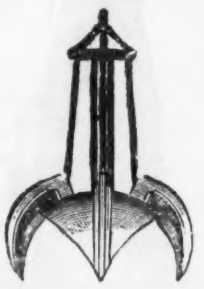

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Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
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Zanesville and Coshocton—10:30 a. m.,6:30 p. m.
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| Marietta Express..... | †11 15 a m | *2 55 p m |
| Bal'o. & Wash. Express.... | *4 00 p m | *10 25 a m |
| Cleve. and Canton Express | †6 30 p m | †8 15 a m |

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt

From Cleveland Union Station.

## PENNSYLVANIA LINES.

**Cleveland & Pittsburgh R. R.**

| | Depart. | Arrive. |
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| For Pittsburgh, Baltimore, Washington, Philadelphia and New York. | 7 45 a m | d5 25 a m |
| | 1 15 p m | 12 50 p m |
| | d11 10 p m | 6 35 p m |
| Wheeling and Bellaire. | 7 45 a m | 12 50 p m |
| | 1 15 p m | 6 35 p m |
| | *11 10 p m | ..... |
| Alliance Accom. | 3 25 p m | 10 10 a m |
| Ravenna Accom. | 5 00 p m | 8 25 a m |

d Daily. * Except Saturday. Other trains except Sunday.

From Cleveland Union Station.

## Mt Vernon and Pan Handle Route

**Cleveland & Pittsburgh R. R.**

| | Depart. | Arrive. |
|---|---|---|
| For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest. | 8 00 a m | d 7 00 am |
| | d 8 00 p m | 5 40 p m |
| For Cuyahoga Falls Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus. | 1 18 p m | 12 50 p m |
| For Cuyahoga Falls Akron, Orrville, Chicago, and all points in the West and Northwest. | 8 00 a m | 5 40 p m |
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| No. 70, Pittsburgh Accom..... | *11 25 a m |
| No. 64, New York & Pitts. Limited... | * 2 50 p m |
| No. 66, Mantua Accommo..... | * 4 20 p m |
| No. 74, Youngst'n Ex..... | † 6 00 p m |
| No. 68, New York & Pitts. Ex..... | *11 00 p m |
| | Arrive. |
| No. 61, N. Y. & Pittsburgh Express... | † 5 15 a m |
| No. 71, Youngstown Accom..... | * 7 15 a m |
| No. 65, New York & Pitts. Lim..... | * 9 55 a m |
| No. 67, Pittsburgh Accom..... | *12 45 p m |
| No. 73, Leavitssburgh Local..... | * 2 10 p m |
| No. 63, New York & Pitts. Ex..... | * 6 50 p m |
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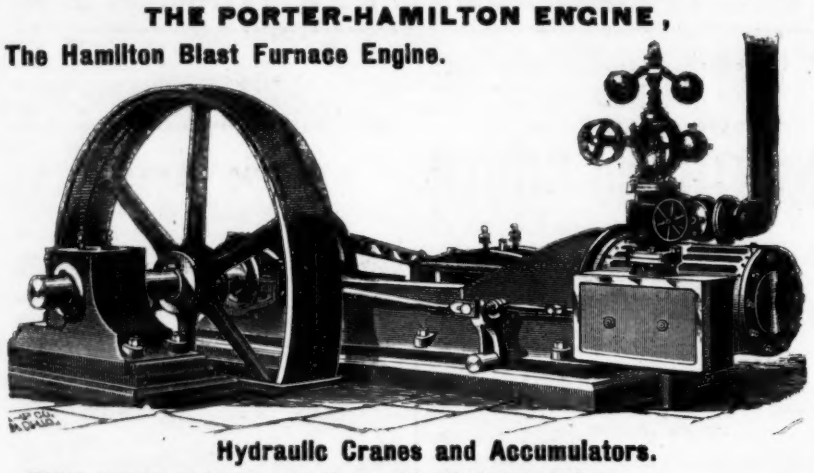

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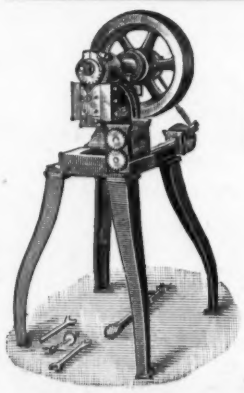

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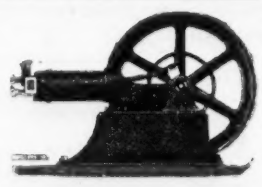

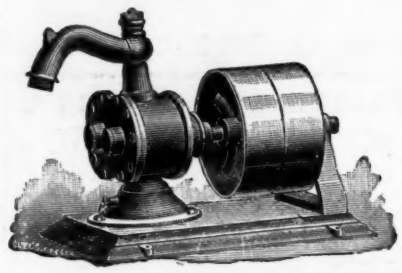

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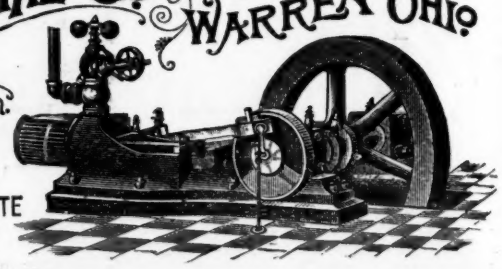

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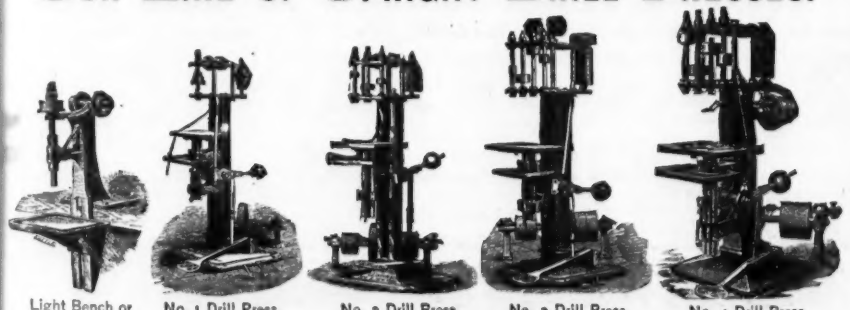

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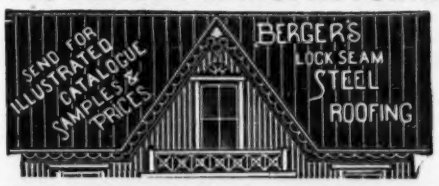


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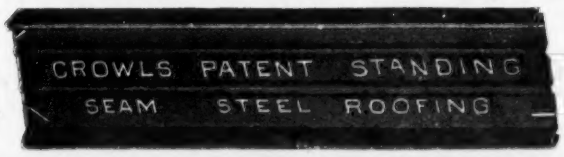


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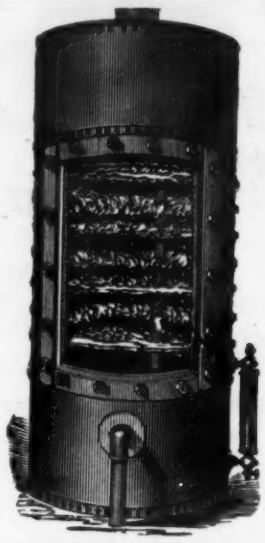

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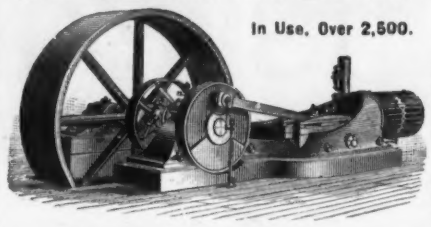

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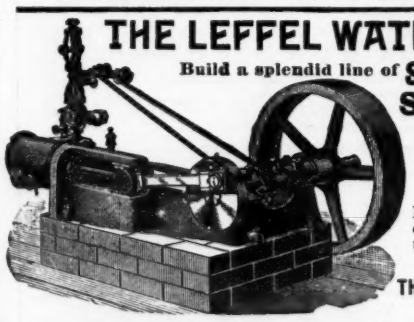

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